TABLE OF CONTENTS

APPENDIX F - SPECIES ACCOUNT AND MANAGEMENT INFORMATION

F.1. Arroyo Toad (*Anaxyrus californicus*) F-1
F.1.1. Status F-2
F.1.2. Distribution and Occurrence F-3
F.1.3. Threats F-5
F.1.4. Recovery Strategy Goals F-6
F.1.5. Management F-6

F.2. Bald Eagle (*Haliaeetus leucocephalus*) F-8
F.2.1. Status F-8
F.2.2. Distribution and Occurrence F-9
F.2.3. Threats F-9
F.2.4. Management F-9

F.3. Bank Swallow (*Riparia riparia*) F-11
F.3.1. Status F-11
F.3.2. Distribution and Occurrence F-11
F.3.3. Threats F-12
F.3.4. Recovery Strategy Goals F-13
F.3.5. Management F-13

F.4. Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*) ... F-13
F.4.1. Status F-14
F.4.2. Distribution and Occurrence F-14
F.4.3. Threats F-14
F.4.4. Recovery Strategy Goals F-15
F.4.5. Management F-15

F.5. Brand's Star Phacelia (*Phacelia stellaris*) F-15
F.5.1. Status F-15
F.5.2. Distribution and Occurrence F-16
F.5.3. Threats F-17
F.5.4. Recovery Strategy Goals F-18
F.5.5. Management F-18

F.6. California Brown Pelican (*Pelecanus occidentalis californicus*) F-19
F.6.1. Status F-19
F.6.2. Distribution and Occurrence F-20
F.6.3. Threats F-20
F.6.4. Recovery Strategy Goals F-21
F.6.5. Management F-21

F.7. California Least Tern (*Sternula antillarum browni*) F-22
F.7.1. Status F-22
F.7.2. Distribution and Occurrence F-22
F.7.3. Threats F-28
F.7.4. Recovery Strategy Goals F-28
F.7.5. Management F-29

F.8. Coastal California Gnatcatcher (*Polioptila californica californica*) F-30
F.8.1. Status F-30
F.8.2. Distribution and Occurrence F-31
F.8.3. Threats F-34
F.8.4. Recovery Strategy Goals F-35
F.8.5. Management F-35
F.9. Least Bell's Vireo (*Vireo bellii pusillus*) F-35
F.9.1. Status F-36
F.9.2. Distribution and Occurrence F-36
F.9.3. Threats F-39
F.9.4. Recovery Strategy Goals F-40
F.9.5. Management F-40
F.10. Light-footed Clapper Rail (*Rallus longirostris levipes*) F-42
F.10.1. Status F-42
F.10.2. Distribution and Occurrence F-43
F.10.3. Threats F-46
F.10.4. Recovery Strategy Goals F-47
F.10.5. Management F-47
F.11. Pacific Pocket Mouse (*Perognathus longimembris pacificus*) F-49
F.11.1. Status F-50
F.11.2. Distribution and Occurrence F-50
F.11.3. Threats F-52
F.11.4. Recovery Strategy Goals F-52
F.11.5. Management F-53
F.12. Peregrine Falcon (*Falco peregrinus anatum*) F-55
F.12.1. Status F-55
F.12.2. Distribution and Occurrence F-55
F.12.3. Threats F-56
F.12.4. Management F-56
F.13. Riverside Fairy Shrimp (*Streptocephalus woottoni*) F-57
F.13.1. Status F-58
F.13.2. Distribution and Occurrence F-58
F.13.3. Threats F-59
F.13.4. Recovery Strategy Goals F-59
F.13.5. Management F-60
F.14. San Diego Button-Celery (*Eryngium aristulatum* var. *parishii*) F-61
F.14.1. Status F-61
F.14.2. Distribution and Occurrence F-61
F.14.3. Threats F-62
F.14.4. Recovery Strategy Goals F-62
F.14.5. Management F-62
F.15. San Diego Fairy Shrimp (*Branchinecta sandiegonensis*) F-63
F.15.1. Status F-63
F.15.2. Distribution and Occurrence F-64
F.15.3. Threats F-64
F.15.4. Recovery Strategy Goals F-65

F.15.5. Management F-65
F.16. Southern California Steelhead Trout (*Oncorhynchus mykiss*) F-66
F.16.1. Status F-66
F.16.2. Distribution and Occurrence F-68
F.16.3. Threats F-70
F.16.4. Recovery Strategy Goals F-70
F.16.5. Management F-71
F.17. Southwestern Willow Flycatcher (*Empidonax traillii extimus*) F-73
F.17.1. Status F-73
F.17.2. Distribution and Occurrence F-73
F.17.3. Threats F-76
F.17.4. Recovery Strategy Goals F-76
F.17.5. Management F-78
F.18. Spreading Navarretia (*Navarretia fossalis*) F-79
F.18.1. Status F-80
F.18.2. Distribution and Occurrence F-80
F.18.3. Threats F-81
F.18.4. Recovery Strategy Goals F-81
F.18.5. Management F-82
F.19. Stephens' Kangaroo Rat (*Dipodomys stephensi*) F-82
F.19.1. Status F-83
F.19.2. Distribution and Occurrence F-83
F.19.3. Threats F-86
F.19.4. Recovery Strategy Goals F-86
F.19.5. Management F-87
F.20. Swainson's Hawk (*Buteo Swainson*) F-89
F.20.1. Status F-89
F.20.2. Distribution and Occurrence F-89
F.20.3. Threats F-90
F.20.4. Recovery Strategy Goals F-90
F.20.5. Management F-91
F.21. Thread-Leaved Brodiaea (*Brodiaea filifolia*) F-91
F.21.1. Status F-92
F.21.2. Distribution and Occurrence F-93
F.21.3. Threats F-94
F.21.4. Recovery Strategy Goals F-95
F.21.5. Management F-95
F.22. Tidewater Goby (*Eucyclogbius newberryi*) F-96
F.22.1. Status F-97
F.22.2. Distribution and Occurrence F-97
F.22.3. Threats F-101
F.22.4. Recovery Strategy Goals F-101
F.22.5. Management F-102
F.23. Western Snowy Plover (*Charadrius alexandrinus nivosus*) F-104
F.23.1. Status F-105
F.23.2. Distribution and Occurrence F-106

F.23.3. Threats F-107
F.23.4. Recovery Strategy Goals F-108
F.23.5. Management F-109
F.24. Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*) .. F-110
F.24.1. Status F-111
F.24.2. Distribution and Occurrence F-111
F.24.3. Threats F-112
F.24.4. Recovery Strategy Goals F-112
F.24.5. Management F-113
F.25. Xantus's Murrelet (*Synthliboramphus hypoleucus*) F-113
F.25.1. Status F-114
F.25.2. Distribution and Occurrence F-114
F.25.3. Threats F-115
F.25.4. Recovery Strategy Goals F-115
F.25.5. Management F-116

FIGURES

Figure F-1. Arroyo Toad Tadpole F-2
Figure F-2. Juvenile Bald Eagles F-8
Figure F-3. Bank Swalllow F-11
Figure F-4. Bank Swallow Current Range In California F-12
Figure F-5. Belding's Savannah Sparrow F-13
Figure F-6. Brand's Star Phacelia Rangewide Distribution F-16
Figure F-7. Brown Pelican F-19
Figure F-8. Base Least Tern Nesting Site F-22
Figure F-9. Present and Historic LBV Range F-36
Figure F-10. Brown Headed Cowbird F-39
Figure F-11. Light-Footed Clapper Rail F-42
Figure F-12. Pacific Pocket Mouse F-49
Figure F-13. Peregrine Falcon F-55
Figure F-14. Stephens' Kangaroo Rat F-82
Figure F-15. Swainson's Hawk F-89
Figure F-16. Thread-Leaved Brodiaea Rangewide Distribution F-92
Figure F-17. Male Western Snowy Plover F-104
Figure F-18. Snowy Plover Chick Banding F-109
Figure F-19. Western Yellow-Billed Cuckoo F-111
Figure F-20. Xantus's Murrelet F-113

TABLES

Table F-1. Summary of California Least Tern Surveys on Camp Pendleton (1969 to 2007) and Within California F-24

Table F-2. Regional Comparison for Estimated California Least Tern Breeding Pairs, 1998 - 2007 ..... F-27

Table F-3. Regional Comparison for Estimated California Least Tern Fledglings, 1998 - 2007 ..... F-27

Table F-4. Summary of Coastal California Gnatcatchers on Camp Pendleton (1989 - 2010) F-32

Table F-5. Regionwide Summary: Status Of California Gnatcatcher Sites Within Known Range In Southern California (Modified From Table 4-1 Of Corey et al. 2003) F-33

Table F-6. Number of Territorial Male LBVs on Different Drainages at Camp Pendleton, 1978 to 2010 ..... F-37

Table F-7. Population and Distribution of Light-Footed Clapper Rails, 1980 - 2007 F-43

Table F-8. Number of Light-footed Clapper Rail Pairs on Different Drainages at Camp Pendleton and California, 1980 – 2008..... F-45

Table F-9. The Distribution and Abundance of Singing (Territorial) Male Southwestern Willow Flycatchers Observed on Different Drainages at Camp Pendleton, 1981 to 2000, and Total Number of Territories, 2001..... F-75

Table F-10. Resident Southwestern Willow Flycatcher Population Estimates for Camp Pendleton, 2000 to 2010..... F-76

Table F-11. Comparison of The Number of Individuals Captured and Density of SKR and DKR, and The Number of Burrows Counted, at the 13 Study Grids in 1996 and 1998 ..... F-85

Table F-12. Tidewater Goby Survey Data For Different Drainages at Camp Pendleton, 1987 - 2010 ..... F-99

Table F-13. Results of Tidewater Gobies Detection Surveys for June 2002 to December 2010 ..... F-100

Table F-14. Western Snowy Plover Nest Monitoring Data, 1994 to 2009 ..... F-107

[This page intentionally left blank.]

APPENDIX F

SPECIES ACCOUNT AND MANAGEMENT INFORMATION

F.1. ARROYO TOAD (*ANAXYRUS CALIFORNICUS*)

The arroyo toad is a small 5.6–8.4 centimeter (cm) long, dark-spotted toad of the family Bufonidae. Adult arroyo toads have a light-olive green or gray to tan dorsum (back) with dark spots and warty skin (USFWS 1999a). The venter (underside) is white or buff and without dark blotches or spots (USFWS 1999a). A light colored, V-shaped stripe crosses the head and eyelids, and the anterior portion of the oval parotoid glands (just behind the eyes) are pale (USFWS 1999a). The iris is dark brown with scattered gold iridophores on the upper and lower portions of the iris (CDFG 1994). There is usually a light area on each side of the sacral (pelvic) hump and in the middle of the back.

Breeding is believed to require air and water temperatures above 11–13 degrees Celsius (°C) and is not triggered by rainfall. During flood events, breeding activities are suspended and resume when stream flow rates decline sufficiently to provide shallow edges with minimal flow rates (AmphibiaWeb 2009). Adult males give an advertisement call during the breeding period, starting about 10 days before any females respond, which is generally initiated in late January or February and concludes early July, although it can be extended in some years depending on weather conditions (Maeton Freel, Los Padres National Forest pers. comm. 1998; USFWS 1999a & AmphibiaWeb 2009). Their call is a soft, high-whistled trill, generally lasting from 4 to 10 seconds. To the untrained observer, it is often mistaken for the call of an insect. Adult males may also emit a release-call (a series of chirps) when grasped by another male toad, or when handled behind the forelimbs by humans; females do not emit such calls (USFWS 1999a).

Arroyo toads breed in the quiet margins of open streams, and avoid sites with deep or swift water, tree canopy cover, or steeply incised banks. Males typically call in water 2–4 cm deep 1–2 meters (m) from shore, facing a low shoreline with a horizon unobstructed by nearby vegetation (Sweet 1992). Substrates are most often gravel and sand, less frequently silt or cobble, and rarely bare bedrock or boulders. The toads do not breed in riffle areas and almost never use pools that are isolated from the flowing channel; side channels and washouts may be utilized, as long as there is some flow through them, but they are abandoned as soon as flow ceases. Females generally avoid streamside areas until they are ready to breed, and appear to select a male from a distance and approach him directly. Egg deposition occurs at the male's calling site and typically requires >1 hour (hr). Intertwined masses of 3–5 clutches in different developmental stages are sometimes encountered, reflecting high site fidelity by males. Eggs are laid in water averaging 9 cm deep (range of 1.3–31.8 cm) on fine sediments where there is no appreciable current; they are virtually never entangled in twigs, roots, or other submerged debris. Deposition sites are fully exposed to the sky. Eggs of arroyo toads are deposited in two strands simultaneously. A sample of 40 clutches averaged 6.8 m (range 3–10.6 m) in length and contained an average of 4,714 eggs (range 2,013–10,368 eggs). There is no evidence that individual females can lay a second clutch (AmphibiaWeb 2009).

Juvenile arroyo toads have a white-gray-tan dorsum with small dark spots and gray reticulations; the venter is white. The large parotoid glands are not evident on young juveniles, but the V-shaped light mark that crosses the eyelids is prominently visible (USFWS 1999a). Juveniles and adults feed on insects, but specialize on ants. When foraging, arroyo toads are often found in the driplines of oak trees, which often lack vegetation, yet have sufficient levels of prey. When active at night, toads can be observed near ant-trails feeding on ants, beetles, and other prey (USFWS 2005a).

FIGURE F-1. ARROYO TOAD TADPOLE
(PHOTO SOURCE: USGS 2003A)

Larval arroyo toads have considerable variation in color depending on their age. By 2 to 3 weeks after hatching, at 9–10 millimeters (mm) in length, the dark-colored larvae have faint gold crossbars on the upper surface of the base of the tail. Within a few days of this, the larvae become uniformly tan dorsally with the exception of some irregular dark crossbars. Ventrally, the larvae are opaque white. Larvae usually metamorphose at 28–40 mm in length (USFWS 1999a). Arroyo toad tadpoles eat microscopic algae, bacteria, detritus, and protozoans from the spaces among pebbles, gravel and sand, or abraded from stones (USFWS 2005a & USGS 2003a).

Adults are typically inactive from August or September to February or March; however, subadults may remain active into early November. The ideal locations and characteristics of hibernation sites are poorly understood, but toads are presumed to select higher stream terraces where the likelihood of disturbance from severe flooding is reduced. Two individuals observed ceased surface activity in early August by burrowing into the stream channel; one of these, when excavated, had produced a thin “cocoon” of shed epidermis. The extent to which toads might use upland areas for hibernation is presently unknown (AmphibiaWeb 2009).

The arroyo toad has evolved in an environmental system that is inherently quite dynamic, with marked seasonal and annual fluctuations in climatic regimes, particularly rainfall. Natural climatic variations, as well as other random events such as fires and earthquakes, coupled with the species’ specialized habitat requirements, are likely to lead to annual fluctuations in arroyo toad populations (USFWS 1999a).

F.1.1. Status

The arroyo toad was listed as a federally endangered species on 16 December 1994 (USFWS 1994e). On 7 February 2001, the USFWS designated approximately 182,360 acres of critical habitat for the arroyo toad (USFWS 2001c, d). A court order set aside the designation on 30 October 2002, and ordered a new evaluation for final rule critical habitat designation for the arroyo toad. On 28 April 2004, a proposed rule to designate approximately 56,135.25 hectares (ha) of critical habitat in Monterey, Santa Barbara,

Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego Counties was published (USFWS 2004g). The final rule which designated approximately 4,732.8 ha in 6 units as critical habitat for the arroyo toad was published on 13 April 2005 (USFWS 2005b). All essential lands in two units that include portions of Camp Pendleton: *Unit 11: San Mateo Creek and San Onofre Creek Basins, San Diego and Orange Counties, and Unit 12: Lower Santa Margarita River Basin, San Diego County,* were either excluded from critical habitat designation under Section 4(b)(2) or Section 4(a)(3) of the Endangered Species Act (ESA).

A recovery plan has been approved for this species (USFWS 1999a). For downlisting from endangered to threatened, 20 self-sustaining metapopulation or subpopulations are required, two of which should be on Camp Pendleton (San Mateo/San Onofre Creek and Santa Margarita River basin). Delisting requires 15 additional metapopulations or subpopulations, none of which are required on Base.

On 13 October 2009, a revised critical habitat designation totaling 44,155.3 ha in Monterey, Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego Counties was proposed, but not finalized by the USFWS. All lands within MCB Camp Pendleton (including the leased lands) were excluded from the revised critical habitat designation due to the benefits afforded to the arroyo toad by the management described in the approved INRMP (USFWS 2009i).

Since the toad was listed, analysis of allozyme data has been found to support the recognition of *Bufo californicus* as a separate species from *Bufo microscaphus*, and phylogenetic analysis of comparative anatomical and molecular genetic data for amphibians found that the Nearctic taxa of *Bufo* should be separated and renamed as the genus *Anaxyrus*. In turn, *Bufo californicus* was renamed *Anaxyrus californicus*. The revised scientific name has been accepted by the Committee on Standard English and Scientific Names of the American Society of Ichthyologists and Herpetologists, The Herpetologists' League, and the Society for the Study of Amphibians and Reptiles; however, official recognition by the USFWS has been proposed, but not finalized (USFWS 2009i).

The recovery priority number for the arroyo toad is 8, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest. The value of 8 indicates that the arroyo toad is a species that faces a moderate degree of imminent threat and has a high probability of recovery (USFWS 2009i).

F.1.2. Distribution and Occurrence

The arroyo toad is endemic to primarily the coastal plains and mountains of central and southern California and northwestern Baja California. These toads breed in stream channels and use stream terraces and surrounding uplands for foraging and wintering. Although the arroyo toad occurs principally along coastal drainages, it also has been recorded at several locations on the desert slopes of the Transverse and Peninsular Mountain ranges south of the Santa Clara River, Los Angeles County (USFWS 1999a). The elevation range for the arroyo toad extends from near sea level to about 2,438.4 m in Baja California. Although arroyo toads may be found along relatively long stretches of some creeks and rivers, suitable breeding or upland habitat may not occur throughout the entire occupied drainage.

The proportion of suitable habitat may change throughout the year and from year-to-year depending on climatic conditions, fires, or other natural or human-related events. Thus, it is difficult to estimate the exact distribution of arroyo toads or the extent of suitable habitat in any particular system at a given time (USFWS 1999a).

In the northern portion of the range, arroyo toads are found in foothill canyons and intermountain valleys where medium- to large-sized rivers are bordered closely by low hills and low riverbed gradients, and the surface stream flows frequently pool or are intermittent for at least a few months of the year (USFWS 1999a). In southern California (central portion of the arroyo toad's range), they also occur on the coastal plain and on a few desert slopes. Arroyo toads are found in habitats that rarely have closed canopies over the lower banks of the stream channel. Heavily shaded pools are generally unsuitable for larval and juvenile arroyo toads because of lower water and soil temperatures and poor algal mat development (USFWS 1999a). Toad habitat requires episodic flooding to keep the low stream terraces relatively vegetation free and the soils friable enough for juvenile and adult toads to create burrows (USFWS 1999a). Shallow pools (less than 30.48 cm deep) with clear-water and flow rates less than 5 cm per second are favored by adults for breeding (USFWS 1999a & USFWS 2009i). Areas that are used by juveniles consist primarily of sand or fine gravel bars with varying amounts of large gravel or cobble with adjacent stable sandy terraces and oak flats. Areas that are damp and have some (less than 10%) vegetation cover are favored by juvenile toads because they possess the refuge and thermal characteristics required for juvenile survival and rapid growth. Bare sand and gravel bars may support large numbers of juvenile toads, but survivorship can be reduced due to high levels of predation (USFWS 1999a). The distance toads are found from the breeding sites depends on the topography and the extent of suitable habitat. The uplands habitat areas are often coastal sage scrub, chaparral, grassland, or oak woodland with substantial areas of fine sand, into which adult toads burrow during the day or other periods of inactivity (USFWS 2005a & USFWS 2009i). Arroyo toads may also seek temporary shelter under rocks or debris, and have been found in mammal burrows on occasion (USFWS 2005a).

The historical range of the arroyo toad extended from the upper Salinas River system on Fort Hunter Liggett Military Reservation, Monterey County south through the Santa Ynez, Santa Clara and Los Angeles River basins, and the coastal drainages of Orange, Riverside and San Diego Counties to the Arroyo San Simeon system, about 16 kilometers (km) southeast of San Quintin, Baja California (USFWS 1999a). The 24 June 1999 final recovery plan, identified 22 drainage basins with recorded arroyo toad sightings since the early part of the twentieth century (USFWS 1999a). Two of the drainages had only single, unverified records at each, and arroyo toads are believed to be extirpated from a third drainage.

Currently, the arroyo toad is known to occupy an estimated 25% of its previous occupied habitat within the United States (Brehme et al. 2004). On Camp Pendleton, the arroyo toad occurs in three major watersheds (Figure 3-31): Santa Margarita, San Onofre, and San Mateo. The population in the Santa Margarita River drainage represents the only one occurring on a major undammed free-flowing river within southern California (Holland & Goodman 1998a); however, hydrological flow within this drainage is not completely

natural (e.g., tributary flow is regulated at Vail Lake Dam). Camp Pendleton represents 3 of the remaining 19 drainage basins where arroyo toads are reasonably believed to be extant. It is likely that some of the largest remaining populations of this species occur on Camp Pendleton (Holland & Goodman 1998a). Additionally, the lower portions of the San Mateo Creek basin, the San Onofre Creek, and Santa Margarita River, all of which are located on Camp Pendleton, may be the only remaining coastal plain lands in southern California on which the arroyo toad occurs within 10 km of the coastline and down to the coastal marsh zone (USFWS 1999a). As such, they may harbor populations with phenotypic characteristics that are now limited in representation throughout the range of the arroyo toad in California. The limited agricultural and urban development on Base likely allowed these populations to persist.

In 2003, a spatial and temporal monitoring approach, as described in the arroyo toad monitoring protocol, that tracks the presence of arroyo toad breeding populations by documenting the presence of eggs and larvae was implemented on Base (Brehme et al. 2004). In 2003, 78% of potential toad breeding habitat contained water during survey efforts. Of these areas, 87.4% (se = 9.5) of the habitat was occupied by breeding arroyo toads. The greatest occupancy was recorded on the San Mateo watershed (97.9%), followed by the San Onofre (90.9%) and Santa Margarita (83.8%) watersheds.

F.1.3. Threats

The arroyo toad's decline has largely been attributed to extensive habitat loss, human modifications to water flow regimes (e.g. dams), and the introduction of non-native predators. Threats to the continued survival of the arroyo toad range-wide include drainage channel modification, exotic plants, and exotic predators: e.g., green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmonides*), black bullhead (*Ameiurus melas*), prickly sculpin (*Cottus asper*), stocked rainbow trout (*Oncorhynchus mykiss*), oriental gobies (*Acanthogobius flavimanus*), red shiners (*Notropis bairdi*), bullfrogs (*Rana catesbeiana*), African clawed frogs (*Xenopus laevis*), and crayfish (*Procambarus clarkii*) (USFWS 2009i). Channelization of drainages increases flowrates and modifies natural sediment distribution, which serves to significantly reduce the availability of suitable habitat within riparian ecosystems for the arroyo toad. Exotic plants such as watercress (*Rorippa* spp.) and giant reed (*Arundo donax*) directly and indirectly affect the condition and formation of ideal breeding pools. Disturbances such as agriculture and road construction can increase sedimentation in arroyo toad breeding pools, rendering them unusable. Older larvae can fall prey to exotic predators (Jennings & Hayes 1994). Bullfrogs are considered the most serious threat of all exotic species to the arroyo toad. They are voracious predators that eat adult toads and are suspected of eating larvae and metamorphs, and since they are more tolerant to a variety of environmental conditions it allows them to colonize and dominate modified stream habitats more readily (e.g., perculation ponds within the lower Santa Margarita River). Arroyo toads can also be killed by vehicular traffic and road maintenance activities.

Global climate change is a new threat to the species that was not identified until post listing. Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying. However, predictions of climatic conditions for smaller sub-regions

such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. It is recognized that climate change is an important issue with potential effects to listed species and their habitats, however, there is a lack of adequate information to make accurate predictions regarding its effects to particular species at this time (USFWS 2009i).

F.1.4. Recovery Strategy Goals

The recovery strategy for the arroyo toad is focused on providing sufficient breeding and upland habitat to maintain self-sustaining populations of arroyo toads throughout the historic range of the species in California, and minimizing or eliminating impacts and threats to arroyo toad populations (USFWS 1999a). Self-sustaining populations are those documented as having successful recruitment (i.e., inclusion of newly matured individuals into the breeding population) equal to 20% or more of the average number of breeding adults in 7 of 10 years of average to above average rainfall amounts with normal rainfall patterns. The arroyo toad will be considered for reclassification from endangered to threatened status in each recovery unit once management plans have been approved and implemented on federally managed lands. This will help secure the genetic and phenotypic variations of the arroyo toad in each recovery unit by conserving, maintaining, and restoring the riparian and upland habitats used by arroyo toads for breeding, foraging, and wintering habitat. The downlisting goal for the Southern Recovery Unit, which encompasses arroyo toad populations and habitat in the coastal drainages of Orange, San Bernardino, Riverside, and San Diego Counties, is 10 populations or metapopulations. A minimum of 2 of these 10 metapopulations are needed in the San Mateo and San Onofre Creeks, and the Santa Margarita River (USFWS 1999a).

The arroyo toad will be considered for delisting when the genetic and phenotypic variations of the arroyo toad throughout its range in California are secured by maintaining 15 additional self-sustaining populations of arroyo toads in coastal plain, coastal slope, desert slope, and desert river basins, including known populations outside of federal jurisdiction.

Based on recent (and past) arroyo toad monitoring results that indicate that viable metapopulations are present in the San Mateo/San Onofre watersheds and the Santa Margarita watershed, Camp Pendleton believes its management for arroyo toads and toad habitat as laid out in the Riparian Ecosystem Conservation Plan (Appendix C) are meeting these downlisting criteria.

F.1.5. Management

The arroyo toad receives programmatic protection from training and other Base activities within the riparian component of its habitat as stipulated/required by the Riparian Ecosystem Conservation Plan (Appendix C). These management measures have been implemented on Base since the completion of the Plan in 1995 and were incorporated in and have been managed through this INRMP since 2001. The Marine Corps believes that these programmatic management actions provide conservation benefit to the arroyo toad. The USFWS stated in their Final Designation of Critical Habitat for the Arroyo Toad that they “find that the INRMP for Camp Pendleton provides a benefit for the arroyo toad” when they exempted the Base from critical habitat, pursuant to Section 4(a)(3) of the ESA

(USFWS 2005b). The U.S. Marine Corps is currently in consultation with USFWS regarding upland habitat basewide including areas occupied by the arroyo toad.

Environmental regulations and restrictions that apply to threatened and endangered species on Base are provided to all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to the arroyo toad include: 1) exotic animal (e.g., bullfrogs) and exotic vegetation control (e.g., giant reed and watercress); and 2) limiting military-related traffic to use existing roads, trails and crossings in riparian areas. See Appendix N (Section 2007 and Figure 2-1).

As part of arroyo toad management efforts, Camp Pendleton has partnered with the U.S. Geological Survey's Western Ecological Reserch Center (USGS WERC) to develop and implement a rigorous, science-based monitoring protocol to track arroyo toad populations on Base. The implemented protocol uses a spatial and temporal approach to document the arroyo toad breeding populations by surveying for the presence of eggs and larvae. Eggs and larvae remain visible in the water for months before metamorphosis, and have a much higher probability of detection than do adult toads (Atkinson et al. 2003). The area in the monitoring design included all 87 km of suitable arroyo toad habitat on the Base; it was continually surveyed over a 5-year period (2004 to 2008) via a rotating panel design that utilized fixed and variable survey points. Final results from the study are still pending. An additional 5-year study is currently being conducted by the USGS WERC that was initiated in 2009. In conjunction with the USGS WERC, the Base also conducted a study in 2002 which examined arroyo toad use of habitat dominated by giant reed (*Arundo donax*), and final results of this study are still pending to date (Brehme, USGS pers. comm. 2010).

Near the Cristianitos entry gate, the Base has completed revegetation of a former agricultural area with coastal sage scrub in San Mateo Creek as upland toad habitat mitigation (Bieber pers. comm. 2010).

Planned actions that support management of the arroyo toad include:

- Implement riparian BO (Section 4.3.2.1.).
- Implement (pending) uplands species habitat conservation plan (Section 4.3.2.2. & Appendices D and O).

F.2. BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

FIGURE F-2. JUVENILE BALD EAGLES
(PHOTO SOURCE: STEVE HILLEBRAND, USFWS)

The bald eagle is the second largest North American bird of prey with a 2.1 m average length wingspan. It has a distinctive white-head and white-tail, offset against a dark-brown body and wings, in adult birds. Females are about 25% larger than males; sexes are otherwise similar in appearance. Young bald eagles are mostly dark-brown until they reach four to six years of age and may be confused with the golden eagle (USFWS 1995b). Bald eagles are opportunistic foragers and diet varies based on prey species availability. They prefer fish, but will eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl (USFWS 2006a).

F.2.1. Status

The USFWS listed the bald eagle, as endangered in the lower 48 states on 11 March 1967 (USFWS 1967). On 12 July 1995, the USFWS reclassified the bald eagle from endangered to threatened as a result of a significant increase in the number of nesting pairs, increased productivity and expanded distribution (USFWS 1995b). On 6 July 1999, the USFWS proposed to remove the bald eagle from the List of Endangered and Threatened Wildlife (USFWS 1999b). Five recovery plans have been published for the bald eagle to date in: 1982, 1983, 1986, 1989, and 1990. On 12 December 2006, the USFWS proposed another rule in anticipation that the bald eagle would be delisted by February 2007; the purpose of the proposed rule was to define the term “disturb” in a manner consistent with the existing Bald and Golden Eagle Protection Act (BGEPA), and to provide a standard to guide bald eagle management following delisting (USFWS 2006c). However, on 8 February 2007, the USFWS announced that it had reached a court-approved agreement allowing the agency to make a final determination on the eagle’s status no later than 29 June 2007. Then on 8 August 2007, the bald eagle was officially delisted (removed) from the ESA List of Endangered and Threatened Wildlife. A Draft Post-Delisting Monitoring Plan was also published in the Federal Register on 9 July 2007, with a comment request period that extended until 9 October 2007. The USFWS also published the National Bald Eagle Management Guidelines in May 2007, and a regulatory definition of “disturb” under the

BGEPA. The bald eagle will continue to be protected by the Migratory Bird Treaty Act (MBTA) and the BGEPA.

Although the bald eagle was removed from the Federal List of Endangered and Threatened Wildlife, as of 2009, it remains listed Endangered under the California Endangered Species Act (CESA), Sensitive on the California Department of Fire list, and Fully Protected according to the California Department of Fish and Game (CDFG 2007 & 2009o).

F.2.2. Distribution and Occurrence

The bald eagle ranges throughout much of North America, nesting on both coasts from Florida to Baja California, Mexico in the south, and from Labrador, Canada to the western Aleutian Islands, Alaska in the north. The bald eagle inhabits estuaries, large lakes, reservoirs, major rivers, and some coastal habitats. They usually nest in trees near water, but are known to nest on cliffs, as well. Breeding season for the bald eagle in the western United States begins in January and ends in August.

In 1782, there were as many as 100,000 nesting bald eagles living in the continental U.S. (USFWS 2005e). Over the years, pesticide contamination, hunting, and habitat loss has caused the dramatic reduction of bald eagle pairs; however, the population of bald eagles in the United States has increased from a low of 487 breeding pairs in 1963 to an estimated 9,789 breeding pairs today (USFWS 2007a).

Bald eagles are a rare, but annual winter visitor to lakes in the foothills and mountains of San Diego County, especially Lake Henshaw. From 1997 to 2002, the number reaching the County varied from 8 to 15 individuals each year (Unitt 2004).

The bald eagle is a rare raptor on Camp Pendleton. In 1995 and 1996, a bald eagle sighting was documented in the Santa Margarita estuary and in Cockleburr Creek, respectively. No other sightings have been documented on Base since. It is an occasional wintering species and has been observed near the Whelan Lake and Windmill Lake vicinity in Oceanside. It generally roosts over several weeks in this area and can be observed hunting waterfowl. The bald eagle has never nested in the coastal San Diego area (Bloom pers. comm. 2005).

F.2.3. Threats

The decline in population was attributed to unregulated shooting that occurred early in the last century, loss of nesting habitat due to development along the coast and near inland rivers and waterways, forest clearing and environmental contaminants (e.g., from dichlorodiphenyltrichloroethane [DDT] use in the 1940s, 1950s, and 1960s). Currently, the Department of the Interior is testing migratory birds for the presence of H5N1 high path avian influenza, which may affect eagles. At this time, there are no confirmed cases of bald eagles testing positive for avian influenza in the United States (USFWS 2007a).

F.2.4. Management

The bald eagle will continue to be protected by the MBTA and the BGEPA. These statutes prohibit unauthorized take and require permits for limited uses of eagles and their parts. The BGEPA authorizes issuance of permits to take bald eagles for the religious purposes of

Indian tribes, and established provisions to remove eagle nests in cases where their location poses a risk to human safety or the eagles themselves. The permits program includes provisions to ensure that any take occurs within limits that would not affect population levels. The agency also further clarified their interpretation of the BGEPA's take prohibition on 5 June 2007, by publishing a final rule defining the term "disturb" as: to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering in its normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (USFWS 2007a). Also noted in the definition, with reference to habitat alteration, the USFWS states that "removal of trees is not in itself a violation of the Eagle Act;" however, the impacts of such action can be a violation if the loss of the trees kills an eagle, or agitates or bothers an eagle to the degree that results in injury or interferes with breeding, feeding, or sheltering habits substantially enough to cause a decrease in productivity or nest abandonment, or creates the likelihood of such outcomes (USFWS 2007a). The USFWS also published the National Bald Eagle Management Guidelines to be used in conjunction with this new definition of the term "disturb". To a much lesser extent, the MBTA provides indirect protection to bald eagle habitat by making it unlawful to, at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory birds, any part, nest, or eggs of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof (USFWS 2007a). The Clean Water Act (CWA) will also continue to protect aquatic habitats upon which the bald eagle depends.

Critical habitat was not designated for the bald eagle, so the delisting will not affect critical habitat provisions of the Act; however, a post-delisting monitoring program is required for all species that have recovered and have been delisted. The draft post-delisting monitoring plan was published the same day as the delisting rule on 9 July 2007, and included a comment period until 9 October 2007 (USFWS 2007b). The final monitoring plan was published on 4 June 2010 and calls for surveys to be conducted every five years over the next twenty years (USFWS 2010h). Monitoring will consist of the collection of bald eagle nesting data at selected locations. At the end of each five-year monitoring event the Service will review all available information to determine the status of the bald eagle. If, at any time during the monitoring period, data indicates that protective status under the Act should be reinstated, listing procedures can be initiated, including emergency listing if necessary (USFWS 2010h).

Since the bald eagle is an extremely rare visitor and is unlikely to nest or forage on Base in numbers that warrant a programmatic approach to their management, any nesting or occurrences that are observed on Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary and in consultation with the USFWS. Programmatic instructions and habitat enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and Riparian Ecosystem

Conservation Plan (Appendix C), guide the management of habitat in potential foraging areas including shallow estuaries and rivers/creeks, respectively. These management measures have been implemented on Base since the completion of the Plans in 1995 and were incorporated in and have been managed through this INRMP since 2001.

F.3. BANK SWALLOW (*RIPARIA RIPARIA*)

FIGURE F-3. BANK SWALLLOW
(PHOTO SOURCE: PETER OSENTON, USGS)

The bank swallow is the smallest North American swallow, with a body length of about 12 cm. Bank swallows are distinguished from other swallows by their distinct brown breast-band contrasting with white under parts. The upper parts are brown. The species nests in colonies, which range in size of 10 to 1,500 nesting pairs in California, although most colonies have 100-200 nesting pairs. The bank swallow requires fine-textured sandy banks or cliffs to dig horizontal nesting tunnels and burrows. Nests are almost always near water, and are lined with grasses and other plant material and feathers. Burrows are 2.5 to 5.5 cm wide and up to 140 cm deep. A small chamber at the end of the burrow contains the nest. The species forages by hawking insects during long, gliding flights. It feeds predominantly over open riparian areas, but also over brushland, grassland, wetlands, water, and cropland on a wide variety of aerial and terrestrial soft-bodied insects including flies, bees, and beetles (CDFG 1999b).

F.3.1. Status

The bank swallow was listed as threatened by the State of California on 11 June 1989 (CDFG 2005b). The species is not listed under the Federal ESA, but it is covered by the MBTA.

F.3.2. Distribution and Occurrence

The species is a Neotropical migrant found primarily in riparian, coastal and other lowland habitats; it arrives in California from South America in early March, and its numbers fall off in July and August. Breeding season begins early May through July.

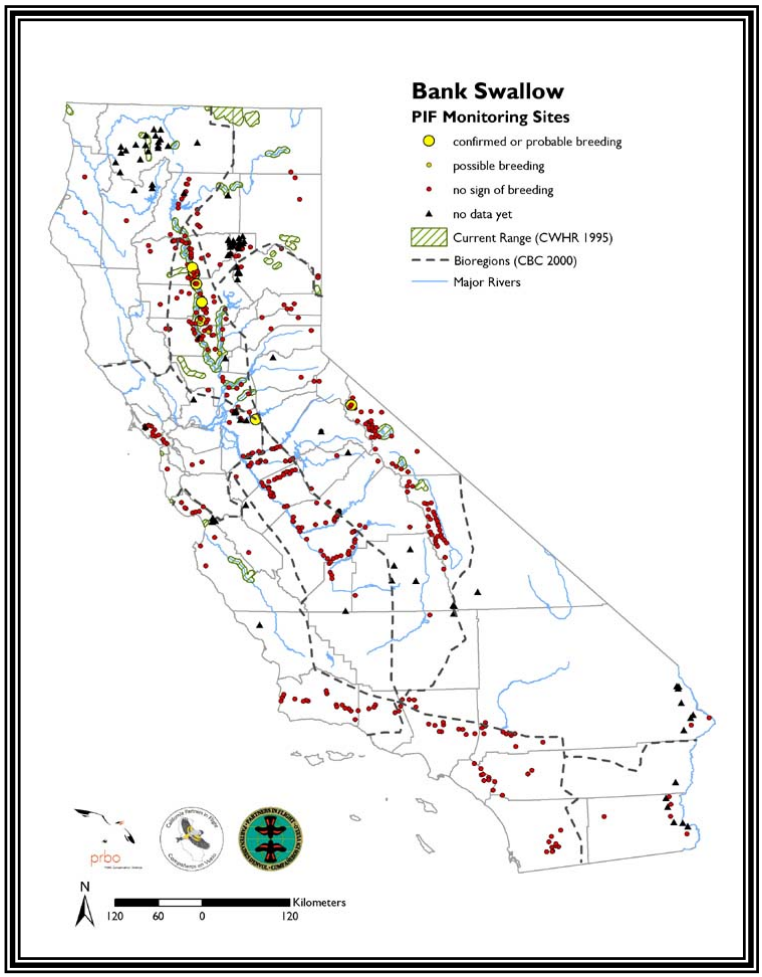

FIGURE F-4. BANK SWALLLOW CURRENT RANGE IN CALIFORNIA
(SOURCE: GARRISON 1998)

Locally, the bank swallow nested in coastal bluffs at Las Flores; eleven egg sets were collected there on 13 May 1917, and eight on 2 May 1919, which was the southern most known breeding colony in North America at the time. Another set taken "north of Oceanside" on 9 May 1925, is the last record of the colony (Unitt 2004). Bank swallows were eliminated from southern California because virtually every river and natural waterway where it was known to occur was converted to flood control channels. Former coastal colonies have been abandoned by swallows due to increased human disturbance. The bank swallow has long been extirpated from the site of its single known colony in San Diego County (Unit 2004), and is considered virtually extinct throughout southern California with the only know remaining breeding colony along the Santa Clara River in Ventura County (Garrison 1998). Even as a fall migrant, the bank swallow is now very rare in San Diego County. In spring, there have only been two records from 1997 to 2002--one with other migrating swallows in Otay Mesa on 15 April 2000, and one at the sewage ponds near the mouth of the Santa Margarita River on Camp Pendleton on 14 April 2002 (Unitt 2004). Only three records exist for the bank swallow during winter months: one at Otay River Valley on 21-22 December 1968, one at Old Mission Dam on 26 January 1976, and up to four near Oceanside from 27 December 1986 to 8 February 1987 (Unitt 2004).

F.3.3. Threats

The rip-rapping of natural stream banks associated with bank protection projects is the single most serious, human-caused threat to the long-term survival of the bank swallow in California. It is projected that as much as 50% (percent) of the remaining population of bank swallows could be lost if all bank protection projects currently proposed are completed. Existing colonies and areas of potential habitat may be lost over the next several years if current planning is implemented. Rip-rap installed by the USACE, under the Sacramento River Bank Protection Project, has already affected almost 241 km of

Sacramento River bank since 1960. Additional rip-rap proposed under this project may result in extensive loss of essential, eroding bank habitat.

Eggs and adults are preyed upon by rats, skunks, house cats, snakes, and some raptors; however, gopher snakes (*Pituophis melanoleucus*) and American kestrels (*Falco sparverius*) are the most common predators in California. Nest sites are also occasionally taken by house sparrows (*Passer domesticus*) (CDFG 1999b).

F.3.4. Recovery Strategy Goals

Although a State recovery plan for the bank swallow was completed and adopted by CDFG in 1992, implementation of the recommendations has not occurred. The recovery plan identifies habitat preserves and a return to a natural, meandering riverine ecosystem as the two primary strategies for recovering the bank swallow (CDFG 1992b). A recovery planning team has also been established and has had periodic meetings since 1990. The group discusses bank swallow research and recovery issues, and has also cited the return to naturally functioning riparian ecosystems as the best way to preserve, recover, and conserve the many species, including the bank swallow, that are dependent on this unique ecosystem (CDFG 2000).

F.3.5. Management

Since the bank swallow is a rare visitor and is unlikely to nest or forage on Base in numbers that warrant a programmatic approach to their management, any nesting or occurrences that are observed on Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary under the Base's MBTA program.

F.4. BELDING'S SAVANNAH SPARROW (*PASSERCULUS SANDWICHENSIS BELDINGI*)

FIGURE F-5. BELDING'S SAVANNAH SPARROW

(PHOTO SOURCE: L. HAYS, USFWS)

The Belding's savannah sparrow is a small (14 cm long) brown sparrow with fine streaking on the head and face, a pale-beige to white belly, and often displays a dark central breast spot. It is similar to other subspecies of savannah sparrows but is darker and heavily streaked on the back, breast, and sides. As with most ground dwelling species, this bird is inconspicuous and blends well with its environment. The most distinguishing characteristic is the yellowish color of the lores (area between the bill and eyes). The Belding's savannah sparrow is one of four subspecies of savannah

sparrows that are otherwise widely distributed and occur in a variety of habitat types, including grasslands, high-elevation meadows, and marshes. The Belding's savannah sparrow is unique in that it represents one of only two wetland-dependant avian species endemic to coastal salt marshes in southern California. This subspecies is a year-round resident of these salt marshes, and is therefore reliant upon these habitats to meet all of its life history requirements (USFWS 1998f).

F.4.1. Status

The Belding's savannah sparrow was listed as State endangered on 10 January 1974 (CDFG 2005b). It is also currently federally listed as a Species of Concern, but receives no protection under the ESA or MBTA (USFWS 2010a).

F.4.2. Distribution and Occurrence

Belding's savannah sparrow is a non-migratory subspecies of the savannah sparrow that is endemic to the coast of southern California and northern Baja California. It resides year-round in coastal salt marshes from Goleta Slough in Santa Barbara County to northern Baja California. Nesting occurs primarily in pickleweed habitat at the higher elevations of the salt marshes, above the reach of the highest spring tide. Total population size may fluctuate annually. A partial statewide survey was conducted in 1973, and the first statewide survey was made in 1977. Since 1986, statewide surveys have been undertaken at five-year intervals. The latest statewide count was coordinated by CDFG in 2006. The 2006 census indicated 3,135 breeding pairs in 29 marshes, the highest State total reported since periodic counts began in 1973, and is 8.2% higher than the next highest count reported in 2001 of 2,902 pairs in 30 marshes (Zembal and Hoffman 2002a & Zembal, Konecny and Hoffman 2006). The results of the 2006 census suggest that the bird is holding its own, with a County population of 1,134 pairs (Zembal, Konecny and Hoffman 2006).

The Belding's savannah sparrow breeds from January to August, and has been found at two locations on Camp Pendleton, Aliso Creek and the Santa Margarita River Estuary. Survey results for Aliso Creek were 11 pairs in 1984, 5 pairs in 1986, 5 pairs in 1992, 0 pairs in 1996, 1 pair in 2001, and 0 pairs in 2006. According to Zembel et al. (1996), the absence of Belding's savannah sparrows on Aliso Creek in 2006 is attributed to military vehicles and personnel moving through the marsh often enough to destroy or critically disturb the habitat; the bit of pickleweed marsh observed remaining was determined to be disturbed too regularly to support breeding activities (Zembal, Konecny and Hoffman 2006). Results for the Santa Margarita Estuary were 125 pairs in 1973, 106 pairs in 1977, 107 pairs in 1986, 120 pairs in 1991, 185 pairs in 1996, 172 pairs in 2001, and 122 pairs in 2006 (Zembal and Hoffman 2002a & Zembal, Konecny and Hoffman 2006). The 50 fewer pairs detected within the Santa Margarita River Estuary in 2006 is attributed to the natural annual cycle of prolonged flooding followed by prolonged drying and hyper-salinity which affects the distribution and abundance of suitable nesting substrate (Zembal et al. 2006).

F.4.3. Threats

Adverse impacts rangewide have included: filling, dredging, and development of wetlands, loss of regular tidal connection with the ocean, and inconsistent tidal influence on upper marsh habitat. At least 75% of southern California's former coastal wetlands have been

lost, and the remainder suffers ongoing degradation (Zembal and Hoffman 2002a). Ongoing concerns are flooding or other disruptions in the natural drainage of coastal wetlands because of upstream development or flood control, human disturbance, including trampling of marsh vegetation, and impact of exotic predators in marshes, especially from domestic cats and non-native red foxes.

F.4.4. Recovery Strategy Goals

No recovery plan or goals have been established for the Belding's savannah sparrow (Zembal and Hoffman 2002a).

F.4.5. Management

Current basewide management practices that directly or indirectly benefit the Belding's savannah sparrow under the Base's Estuarine and Beach Ecosystem Conservation Plan include, but are not limited to: restoration efforts in estuarine/beach areas that are temporarily disturbed from non-routine maintenance and construction activities, exotic vegetation removal/control, and monitoring stream water quality, flood regimes, and storm event frequency to determine and manage the potential effect on beach and estuarine habitats. Additionally, the Base's management program provides programmatic instructions to users of the Base that limit activities during breeding seasons and in significant environmental resource areas. These programmatic instructions include the requirement for vehicles to remain on existing roads and trails in the vicinity of coastal marshes/lagoons during breeding seasons, prohibits foot traffic in all coastal marshes during breeding seasons and prohibits foot traffic all year long in the Santa Margarita Estuary and at the mouth of Cockleburr Canyon (except for prescribed maintenance and monitoring activities). The Base grants access to statewide surveyors for Belding's savannah sparrow surveys.

F.5. BRAND'S STAR PHACELIA (*PHACELIA STELLARIS*)

Brand's Star Phacelia is an herbaceous annual in the Hydrophyllaceae (waterleaf) subfamily of the Boraginaceae family of flowering plants. The species is spreading to erect ranging from 6.4 to 25.4 cm tall. Leaves are basal, deeply lobed, and 0.5 to 7.6 cm long. The lower pedicels are recurved, and usually longer than the upper ones. The calyx lobes are 3 to 4 mm long when in flower, and 5 to 8 mm long when in fruit. This species of *Phacelia* is distinguished from other similar taxa by its annual habit, pinnately deeply lobed leaves, calyx lobes that are 3 to 4 mm long, small (less than 5 mm) usually deciduous corollas, corolla scales 0.5 mm or less in length, and its coarsely pitted seeds (USFWS 2004j).

F.5.1. Status

Brand's star phacelia was listed as a Candidate under the Federal ESA in 2004, and currently has a listing priority number of 5 (non-imminent threat of extirpation) (USFWS 2008b); candidate species do not receive protection under the ESA, although the USFWS works to conserve them. Brand's star phacelia is included as a List 1B plant, (rare, threatened, or endangered in California and elsewhere) and under a Threat Code of 1 (seriously endangered in California) in the California Native Plant Society's (CNPS)

Inventory. It is not listed by the CDFG as endangered or threatened (Nature Serve 2009), however, it is listed as a Special Plant due to its federal Candidate status (CDFG 2009m).

F.5.2. Distribution and Occurrence

Brand's star phacelia is annual whose population varies yearly depending upon environmental conditions at each know location. It primarily occurs within coastal dunes and sandy washes in Diegan sage scrub habitat, and is a sensitive plant associated with the southern foredune community. This species was historically found in Los Angeles, Riverside, and San Diego Counties, and in coastal northern Baja California, Mexico. A significant portion of the linear extent of the coastal occurrences of this species has been lost to urbanization and habitat degradation. All five of the occurrences of Brand's star phacelia in Los Angeles County are only historical, with the last documented in 1943. This species was also documented from Riverside County in Fairmont Park based on a specimen collected in 1925. Brand's star phacelia was first collected in San Diego County in 1881. Six historical occurrences are known from San Diego County: San Diego in 1882, the San Diego River last documented in 1882, Crown Point last collected in 1935, Old San Diego last collected in 1881, North Coronado last collected in 1891, and Silver Strand last collected in 1935 (USFWS 2004j). Only 3 of the 15 sites in the United States ever known to support populations of this species still remain, two of these three known extant populations are in coastal San Diego County. The other is in western Riverside County. Two populations may remain in Mexico, although one has not been verified since 1975.

FIGURE F-6. BRAND'S STAR PHACELIA RANGEWIDE DISTRIBUTION

(SOURCE: USFWS 2008B)

Brand's star phacelia was discovered on Camp Pendleton in 1993 during a rare plant survey of the Santa Margarita Dunes. Prior to this study, there was no record of Brand's star phacelia north of the Silver Strand State Beach (16.1 km north of the U.S. Mexican border). This small new population was found just along the eastern fence line of the North Spit of the mouth of the Santa Margarita River (North Blue Beach), and it represented a northern range extension of 72.4 km for this species. Since the distribution of Brand's star phacelia is very limited, the new population was noted as being of extremely high biological significance (Garcia and

Associates 1996). The site supported 88 plants in three subpopulations over an area of 35 square meters (m^2). This population was subsequently reported to consist of 88 plants in an area of 45 m^2 (BioSystems Analysis 1994). Fifty (50) plants were found in the same area in 1994, and forty-eight (48) plants were found in 1995. In 1996, 45 plants were counted, with only 25 occurring within one of the three previously known subpopulations; however, a new subpopulation was identified in an area measuring 2 meters by 5 meters (Garcia and Associates 1996). The Final Biological Survey Report for Rare Plants at MCBCP indicated that Brand's star phacelia was not found during 1997 surveys (RECON 1999).

The 2000 rare plant survey of the Base (Tierra Data Systems 2000a) surveyed approximately 5.63 km of beach habitat and found 14 live plants and 101 small dead plants, presumably from the prior year, in its previously identified area just east of the least tern colony at the mouth of the Santa Margarita River. The plants found closely resembled the description of Brand's star phacelia in the Jepson Manual, but there were some important features which did not match the description, including style and stamen length and number of seeds (Tierra Data Systems 2000a). The data from this report may be inaccurate because the photographs included in the report apparently depict a different and more common species of *Phacelia* (USFWS 2004j). In 2002, the presence of Brand's star phacelia at this site was reconfirmed by Base and USFWS staff (USFWS 2004j). In May 2007, three flowering Brand's star phacelia individuals were encountered at the documented North Blue Beach location; no dried plants were observed in the area. The small number of plants observed is attributed to below average rainfall of 8.08 cm in 2007 (AMEC 2007a).

Brand's star phacelia has also been found on State lands at Border Field State Park within a few hundred yards of the U.S./Mexico border fenceline. This occurrence, consisting of a few plants in sandy soil, was recorded by CNDDB (2000) and reportedly supported about 80 plants when visited during a March 2002 survey. The occurrence consisted of two areas, one 4 m^2 and another 6 m^2 (USFWS 2004j).

A specimen of Brand's star phacelia collected in 2000 by Oscar Clark in western Riverside County, on land designated as Regional Park Open Space near an area where a collection was made in the 1930s, was verified by Andy Sanders (USFWS 2004j).

The total number of individuals range-wide were estimated at around 500 in 2004 by USFWS, and 1,550 in 2006 by CNDDB (NatureServe 2006 & 2009).

F.5.3. Threats

Threats to this species are primarily from existing and potential destruction, modification, and/or curtailment of its habitat or range. A significant portion of the linear extent of this species coastal habitat, sandy washes and dune in the Diegan sage scrub has been lost to urbanization and habitat degradation. In addition to urbanization, threats to this species include trampling or habitat degradation by foot, equestrian and vehicular traffic, and the invasive spread of non-native plants (e.g., *Carpobrotus edulis* and *Carpobrotus Chilensis*) (USFWS 2004j & NatureServe 2009).

Brand's star phacelia is closely related to *phacelia douglasii* and *phacelia insularis*, and it is suggested that in at least part of its range that Brand's star phacelia has hybridized with one or both of these species to produce "intermediates" (Nature Serve 2006). Although hybridization with other species within the genus will ultimately cause genetic degradation of the listed species over time (Nature Serve 2006), hybridization can play an important role in evolutionary biology. While most hybrids are disadvantaged as a result of genetic incompatibility, the fittest survive, regardless of species boundaries. Although rare, hybrids may have a beneficial combination of traits allowing them to exploit new habitats or to succeed in a marginal habitat where the two parent species are disadvantaged. Through the process of hybrid speciation, successful hybrids could evolve into similar new species within 50-60 generations. Some scientists speculate that life is a genetic continuum rather than a series of autonomous species (Wikipedia 2009a, b & Schwenk et al. 2008).

F.5.4. Recovery Strategy Goals

No recovery plans or goals are available for Brand's star phacelia.

F.5.5. Management

After this species discovery on Base in 1993, Camp Pendleton initiated the development of a coastal vegetation restoration and management plan. During three years of descriptive and experimental field studies, surveys were conducted and experiments on ice plant removal treatments were conducted. In April 1996, a fence enclosure approximately 100 m long and 25 m wide around the known Brand's star phacelia population was constructed. The enclosure was located immediately adjacent to the eastern fence line of the Base's California least tern colony, so it was extended to include the *Phacelia stellaris* habitat area.

Since 1996 Brand's star phacelia populations on Camp Pendleton have been protected under the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) from disturbance, vehicular traffic and unregulated human foot traffic due to their location in the Santa Margarita Management Zone and inclusion within the California least tern colony fenced area. Although beneficial to this plant in the long-run, thinning and removal of some non-native plant cover (especially ice plant) to improve habitat for the California least tern on Base may affect plants and habitat for Brand's star phacelia. The impact to the site from trampling during monitoring and management activities is small compared to the potential impacts from the invasive spread of ice plant. While herbicide is applied to the invasive exotic ice plant in the area, herbicide is not used for vegetation control near pin flags marking the immediate vicinity of the location of Brand's star phacelia. The USFWS has supported the continuing efforts of the Base to control exotics within the California least tern enclosure which was expanded to include the Brand's star phacelia occurrence (USFWS 2004j).

In 2004, Camp Pendleton funded a project to develop an inventory protocol for Brand's star phacelia. The protocol was finalized and approved in 2008, however, only a limited basewide survey utilizing the new inventory protocol has been completed to date. The species was not detected at its historical location at the mouth of the Santa Margarita River.

F.6. CALIFORNIA BROWN PELICAN (*PELECANUS OCCIDENTALIS CALIFORNICUS*)

FIGURE F-7. BROWN PELICAN

(SOURCE: USFWS 2009J)

The adult California brown pelican is a large, dark gray-brown waterbird with white about the head and neck. Juveniles are gray-brown above and on the neck, with white underparts. This species can reach up to 3.63 kilograms (kg), and larger individuals have a wingspan of over 2.13 m. The California brown pelican mainly eats fish, especially menhaden, mullet, sardines, pinfish and anchovies, and sometimes krill and crustaceans. They have extremely keen eyesight and typically dive into the water from up to 18 to 21 m in the air to catch prey; they forage in shallow estuarine and inshore waters, mostly within 10 km of the coastline (USFWS 2005f & USFWS 2009j). Pelicans are rarely reported scavenging or preying on eggs or young of waterbirds (USFWS 2005f).

Pelicans are social and gregarious, and congregate in large flocks much of the year. They nest in large colonies and typically begin breeding at 2 to 5 years old. Brown pelicans build large, bulky nests on the ground, in bushes or on tree-tops, and lay an average of three chalky white eggs, which the parents take turns incubating. After about 30 days, the eggs hatch and the blind, featherless, and altricial young require constant warmth and attention for several weeks afterwards. Average age of first flight is 75 days, and at about 12 to 13 weeks of age the young are left to fend for themselves. Many young pelicans unskilled at obtaining food don't survive this period. Pelicans are known to live for approximately 30 years, but the average lifespan may be much less than that due to predation, disease, starvation, etc. (USFWS 2009j & USFWS 2009k).

F.6.1. Status

The USFWS listed the brown pelican (*Pelecanus occidentalis*) as federally endangered on 2 June 1970 (USFWS 1970a, b). A Recovery Plan for the DPS of the California brown pelican (*Pelecanus occidentalis californicus*) was published on 3 February 1983, previous to its official reclassification as a DPS on 4 February 1985. On 20 February 2008, a 12-Month Petition Finding and Proposed Rule to delist the California brown pelican by the

USFWS recommended that the species be removed from the Federal List of Endangered and Threatened Wildlife due to recovery; delisting was finalized on 17 December 2009. Although the California brown pelican no longer receives full protection under the ESA, it remains under limited protection from the MBTA, the Fish and Wildlife Coordination Act, and the Estuary Protection Act (USFWS 2008k & 2009i).

On 26 May 2006, the California Fish and Game Commission received a petition to delist the California brown pelican DPS. On 19 December 2008, the subspecies was recommended as a State Candidate for Delisting (SCD) by the CDFG, and on 5 February 2009 the recommendation for delisting was adopted (CDFG 2008a & SCFGC 2008). The CDFG finding was based upon the following criteria: 1) the breeding population size of the brown pelican in the Channel Islands has increased from 1969 to the present, after the banning of DDT, and now exceeds the 3,000 pair five-year mean standard noted in the recovery plan (in 2006 the Channel Islands population was roughly 8,500 breeding pairs); 2) California brown pelicans have gradually expanded their nesting sites in the Channel Islands to former breeding sites, and numbers on Santa Barbara Island have increased substantially since 2001; 3) productivity has increased to 0.7 and now meets or exceeds the five-year mean 0.7 standard noted in the recovery plan for downlisting; 4) relative to the five-year mean standard for fledged young in the recovery plan, brown pelicans at West Anacapa Island have achieved the 2,700 fledgling standard for delisting 9 times from 1997-2005; 5) in spite of known threats (*i.e.*, oil spills, human disturbance, starvation events, domoic acid poisoning, and fish hook/line mortality), the breeding population of brown pelicans in California has increased substantially; and 6) nesting sites are under generally-protective NPS ownership or management. The brown pelican will remain a fully protected species under Fish and Game Code section 3511(b)(2) (SCFGC 2008).

F.6.2. Distribution and Occurrence

Brown pelicans are found along the Pacific, Atlantic, and Gulf coasts and some inland waterbodies of the U.S. They nest on offshore islands from Maryland south to Venezuela, and from California south to Chile. In the 60s and 70s, brown pelican populations decreased dramatically due to the consumption of fish that contained DDT and other pesticides. Since brown pelicans incubate their eggs by standing on them with their toes spread-over the eggs, thinned eggshells caused by DDT broke under the pressure of the incubating brown pelicans (especially if disturbed), leading to low reproductive success (UC Santa Cruz 2006). Populations recovered somewhat after DDT was banned in the U.S., although the current range of this species is still slightly reduced from historic distributions. The most recent estimate of the total population from California to Mexico along the Pacific coast in 2007 was 142,400 breeding birds or 71,200 breeding pairs; the Southern California Bight population was estimated at 11,695 breeding pairs at 10 locations (USFWS 2008a). Its breeding season typically begins in January and ends in April. Although the California brown pelican does not use the Base as a breeding ground, it feeds in shallow estuary waters, and uses sand spits and offshore sandbars for daily loafing and as nocturnal roosting areas.

F.6.3. Threats

The most recent population estimate of approximately 142,400 breeding birds (in 2007) along the Pacific Coast, suggests that the species is resilient to known threats, and led to

ESA delisting on 17 December 2009. Their nesting habitat is not considered threatened because all of the nesting colonies occur within the protected Channel Islands National Park (CHINP) (USFWS 2007c). Brown pelicans and their habitat are still potentially threatened by: injuries related to fishing gear, collisions with vessels, erosion, plant succession, hurricanes, storms, tidal flooding, tick infestations, consumption of fish contaminated by pesticides, sewage and oil spills, and unpredictable fluctuation in food supplies; however, their current population is considered resilient enough to deal with these factors (USFWS 2007c, 2008a & 2009i).

F.6.4. Recovery Strategy Goals

The USFWS proposed that the California brown pelican be removed from the Federal List of Endangered and Threatened Wildlife due to recovery of the species on 20 February 2008 (USFWS 2008a), and this action was finalized on 17 December 2009 (USFWS 2009k). The primary objective of the apparently successful recovery plan for the California brown pelican was to restore and maintain stable, self-sustaining populations throughout its range by: 1) maintaining existing populations in Mexico; 2) assuring long-term protection of adequate food supplies and essential nesting, roosting, and offshore habitat throughout its range; and 3) restoring population size and productivity to a self-sustaining level in the Southern California Bight (USFWS 2008a & 2009k).

Colony occupancy and number of nesting pairs will be monitored annually for 10 years to determine whether the species remains secure from the risk of extinction after the protections of the ESA no longer apply. If a major colony is abandoned or a downward trend in the number of nesting pairs is observed, especially one that the USFWS and its partners consider to be outside the bounds of natural variation, the USFWS will attempt to determine the reason(s) for the decline. If a human-related threat is identified as a causative factor in a decline, the USFWS will work with its partners, land managers and landowners, other Federal and State agencies, and conservation organizations to address the threat and work to avoid the need to relist the brown pelican (USFWS 2009p).

F.6.5. Management

Since the California brown pelican has not been documented nesting on Base, a programmatic approach to their management is not warranted, however, any nesting sites or occurrences that are observed on Base will be addressed on a case-by-case basis with avoidance and minimization measures implemented as necessary. Programmatic instructions and habitat enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) guide the management of habitat and potential foraging areas including shallow estuaries. These management measures have been implemented on Base since the completion of the Plan in 1995, and were incorporated in and have been managed through this INRMP since 2001.

F.7. CALIFORNIA LEAST TERN (*STERNULA ANTILLARUM BROWNI*)

FIGURE F-8. BASE LEAST TERN NESTING SITE

(PHOTO SOURCE: CAMP PENDLETON)

Least terns are the smallest members of North American terns (family - Laridae, subfamily - Sterninae), measuring about 22.9 cm long with a 50.8 cm wingspan. The least tern has a distinctive black cap and loral (space between the eyes and bill) stripe contrasting a white forehead. The remaining upperparts are gray with white underparts. In flight, a black wedge on the outer primaries is prominent, as well as the short, deeply-forked tail. It has a dark-tipped, orange-yellow bill and orange-yellow legs. The sexes are similar except the loral stripe is wider in the male.

F.7.1. Status

The California least tern (*Sternula antillarum browni*) was federally listed as an endangered species by the USFWS in 1970 (USFWS 1970a, b), and State listed as an endangered species on 27 June 1971 (CDFG 2008a). On 7 February 2005, the USFWS initiated a 5-year review of 58 species under section 4(c)(2)(B) of the ESA to ensure that the classification of the species listed as threatened or endangered on the List of Endangered and Threatened Wildlife and Plants was accurate, and based on the best scientific and commercial data currently available. On 14 February 2007, notice of completion of the 5-year review was announced, and it included a recommendation for downlisting the species to threatened status; however, a final ruling on this action is currently pending (CDFG 2008a). No critical habitat has been designated for this species and the recovery plan has been revised several times (USFWS 1980, 1985a). Additionally, the California least tern is further protected by the MBTA.

F.7.2. Distribution and Occurrence

The California least tern is a migratory bird that historically nested in large beach colonies along the coastline from southern Baja, Mexico to coastal central California. Over time, California least tern nesting habitat has been drastically reduced as a result of regional urbanization. Nesting is currently limited to San Francisco Bay and areas along the coast from San Luis Obispo County to San Diego County. The largest concentrations of breeding pairs nest in Los Angeles, Orange and San Diego Counties, typically between 1 March and 15 September. Migration routes and wintering range for the California least tern are not

well known; it is thought that this species winters along the Pacific Coast of Central America.

California least tern populations have declined since the early 1900s. At least 1,000 nesting pairs of least terns were reportedly observed along a three-mile section of coastline in San Diego County from Pacific Beach to Mission Bay in the early 1900s (Foster 2002). By 1969, the statewide tern population was down to 182 pairs (Patton 2002). During 1969, a representative from the CDFG implemented a plan for lagoon and estuary habitat management (MCBCP 1969). In cooperation with the Department of Interior, the Base set aside a portion of the beach near the mouth of the Santa Margarita River as a tern nesting area. Signs were posted designating the area as a refuge and to discourage vehicles and personnel from entering the area. During the 1973 listing, the statewide tern population totaled 625 pairs (Caffrey 1993). Since then, intensive management practices have resulted in an increase in the tern population; in 1992 the statewide tern population was up to 2,106 nesting pairs (Massey 1989; Caffrey 1993) and in 2005 a statewide record-high of 7,100 pairs was reported, which represents more than twice the average annual breeding population size observed during the mid-1990s (CalEPA 2004 & USFWS 2006f). There are currently 47 known nesting clusters in California (USFWS 2006f), the five most populous sites being Camp Pendleton, the Los Angeles Harbor, Naval Base Coronado, Batiquitos Lagoon, and Point Mugu, which collectively host 71% of the entire CLT population (USFWS 2006f).

The California least tern was first documented nesting on Base in 1969, and it has been documented on Base annually since then. Typically, terns arrive in mid-April and depart by September (Foster 2002). This small migratory tern nests colonially on undisturbed, sparsely vegetated and flat areas with loose, sandy, or saltpan substrate. On Camp Pendleton, California least tern nesting sites are located at the Santa Margarita River mouth (Blue Beach), North Beach, French, and Aliso Creeks (White Beach). Nesting also occurs on the salt flats of the Santa Margarita Estuary. In 2007, a total of 1,422 breeding pairs established 1,530 nests and produced 369 fledglings, the highest number of breeding pairs and nests of any site within the State. As in 2004, 2005, and 2006 the Santa Margarita River North Beach sites (North and South) had the majority of the California least tern nesting and production, representing 84% of the pairs and 97% of the fledglings at Camp Pendleton in 2007. A chick mortality rate of 15% in 2007 was significantly decreased from a high chick mortality of 43% in 2006, 49% in 2005 and 57% in 2004 (Marschalek 2008). Figure 3-11 illustrates the general distribution of the California least tern on Base. Least terns are opportunistic feeders known to capture more than 50 species of fish in relatively shallow, near-shore waters and coastal freshwater ponds, channels, and lakes. A summary of the California least tern surveys on Camp Pendleton between 1969 and 2007, and statewide totals are shown in Table F-1.

The Base's management efforts since 1988 have coincided with an increase in the nesting populations on Base. In 1992, 43% of the California least tern nesting population was located on Department of Defense lands, including 18% on Camp Pendleton (Caffrey 1993). In 1999, the number of nesting pairs in San Diego County was up to 2,333, with 672 (29%) found on Camp Pendleton (Keane 1999). In 2000, statewide surveys showed that approximately 23% of the 4,521 nesting pairs and 27.6% of the season's fledglings were

located on Camp Pendleton (Patton 2002). The nesting colony at Camp Pendleton continues to be the largest in the State with approximately 21.1% of the 6,744 nesting pairs in 2007 (Marschalek 2008).

TABLE F-1. SUMMARY OF CALIFORNIA LEAST TERN SURVEYS ON CAMP PENDLETON (1969 TO 2007) AND WITHIN CALIFORNIA

		Nesting Sites[a]					
Year		**SMR-N**	**SMR-S + SF (including SFI + LORAC)**	**White Beach**	**Red Beach**	**Base Total[f]**	**Statewide (CA) Total[g]**
1969	Pairs	75 - 100	30 - 50			105 - 150	
	Nests						
	Fledglings						
1970	Pairs	19 - 38	0			19 - 38	256 - 294
	Nests						
	Fledglings						
1971	Pairs					300	
	Nests	86	250			336	
	Fledglings					195 - 233	
1972	Pairs						
	Nests	33	197			230	
	Fledglings					92 - 110	
1973	Pairs					250	625
	Nests					315	
	Fledglings					200	
1974	Pairs					150	582
	Nests						
	Fledglings						
1975	Pairs					150	600
	Nests					182	
	Fledglings					160	
1976	Pairs					125	664
	Nests						
	Fledglings						
1977	Pairs					120	775
	Nests						
	Fledglings					<30	
1978	Pairs					30 - 40	800
	Nests						
	Fledglings					8	
1979	Pairs	32 - 40	0	15		47 - 55	850
	Nests	30 - 32	0	15		45 - 47	
	Fledglings	18 - 25		5 - 10		23 - 35	650
1980[b]	Pairs	12 +	32 +	30 +		74	900
	Nests	12	24	45		57	
	Fledglings	1 - 4	1	25 +		27 - 30	745
1981[c]	Pairs	45 - 75	27 - 38	23		96 - 137	975
	Nests	45 - 75	27 - 38	23		96 - 137	
	Fledglings	25 - 35	14 - 25	10		49 - 70	826
1982	Pairs	100 - 115	15 - 30	1		116 - 146	1,015
	Nests						
	Fledglings	50	0	0		50	469
1983	Pairs					233[d]	1,196 - 1321
	Nests	144	103	13		260	
	Fledglings					201	887 - 902

		Nesting Sites[a]					
Year		**SMR-N**	**SMR-S + SF (including SFI + LORAC)**	**White Beach**	**Red Beach**	**Base Total[f]**	**Statewide (CA) Total[g]**
1984	Pairs	221 - 227	9 - 10	10 - 13		240 – 250[d]	1,009 – 1,083
	Nests	234	10	16		260	989
	Fledglings	112	1	4		117	511 - 532
1985	Pairs					205[d]	962 - 1,084
	Nests	201	1	7		209	
	Fledglings	108	0	11		119	607 - 701
1986	Pairs					177[d]	906 – 1,015
	Nests	163	31	4		198	
	Fledglings	206	31	0		237	827 - 947
1987	Pairs					240[d]	931 - 959
	Nests	234	49	0		283	
	Fledglings					65	595 - 699
1988	Pairs	184	62	0		246	1,253
	Nests	232	83	0		315	
	Fledglings	297	107	0		404	1,130
1989	Pairs	125	38	12		175	1,240
	Nests	195	43	29		267	
	Fledglings	50	17	14		81	764
1990	Pairs	244	49	20		313	1,706
	Nests	300	56	23		379	
	Fledglings	230 - 280	45 - 55	21		296 - 356	1,581
1991	Pairs	259	69	33		361	1,830
	Nests	272	76	39		387	
	Fledglings	294	83	52		429	1,784
1992	Pairs	269	65	31		365	2,106
	Nests	270	65	31		366	
	Fledglings	166	35	11		212	1,362 - 1,448
1993	Pairs	338	97	31		466	2,400
	Nests	404	119	38		561	
	Fledglings	396	54	15		465	1,848 – 2,009
1994	Pairs	371	75	42		488	2,792
	Nests	409	84	45		538	
	Fledglings	375	70	18		463	1,755 - 1,871
1995	Pairs	294	41	28		363	2,585 – 2,611
	Nests	337	49	34		420	
	Fledglings	102 - 118	5	5		120	1,064
1996	Pairs	500 - 557	83	38		624	3,330 – 3,392
	Nests	631	84	56		771	
	Fledglings	150 - 250	2 - 10	5 - 10		213	2,120
1997	Pairs	736	80	17		833	4,017
	Nests	758	84	19		861	
	Fledglings	930 - 1,000	45 - 50	18		1,031	3,231
1998	Pairs	649	80	31		760	4,141 – 4,182
	Nests	665	83	34		782	
	Fledglings	265	20 - 30	15 - 20		310	2,686 – 2,810
1999	Pairs	559	60	53		672	3,451 – 3,674
	Nests	661	79	56		796	
	Fledglings	42 - 46	3	3		48 - 52	671 - 711
2000	Pairs	910	83	36		1,029	4,521 - 4,790
	Nests	950	89	40		1,079	5,301
	Fledglings	980 - 1,075	15 - 40	25 - 30		1,020 - 1,145	3,710 - 4,013

Nesting Sites[a]							
Year		SMR-N	SMR-S + SF (including SFI + LORAC)	White Beach	Red Beach	Base Total[f]	Statewide (CA) Total[g]
2001	Pairs	889	67	37		990 - 993	4,672 - 4,832
	Nests	951	69	44		1,064	5,319
	Fledglings	237	7 - 12	5 - 15		249 - 255	2,442 - 2,891
2002	Pairs	514	31	39		584	3,511 – 3,626
	Nests	531	31	40		602	4,093
	Fledglings	31 - 32	0	5		36 - 37	442 - 809
2003[e]	Pairs	1009	82	78	9	1178	6,688 - 6,901
	Nests	1073	93	82	9	1257	7,698
	Fledglings	125 - 450	9	11 - 20	3	148 - 482	2,206 - 3,170
2004	Pairs	1194	74	86	1	1355	6,354
	Nests	1251	76	102	1	1440	
	Fledglings	37 - 45	3 - 6	7 - 9	0	47 - 60	
2005	Pairs	297	950	98	3	2696	7003 - 7372
	Nests	374	1150	136	3	1663	8116
	Fledglings	39	256 - 363	3-20	1	299 - 423	1681 - 2091
2006	Pairs	275	990	137	21	1423	7006 - 7293
	Nests	301	1065	147	27	1540	8173
	Fledglings	35	439	30	16	520	2571 - 3644
2007	Pairs	266	1035	109	12	1422	6744 - 6989
	Nests	288	1111	117	14	1530	7667
	Fledglings	60	267	38	4	369	2293 - 2639

[a] Locations: Santa Margarita River North (SMR-N), Santa Margarita River South (SMR-S), Salt Flats (SF), Salt Flats Island (SFI), Long Range Accuracy - part of the old LORAN navigation system (LORAC), White Beach (also known as Aliso Creek). Blank cells represent no survey performed.

[b] Plus "+" sign indicates numbers were estimated by original author.

[c] One additional location at San Mateo (only in 1981) had 1 pair with no fledglings.

[d] This method for estimating number of pairs assumes that half the nests after 15 June were pairs that were renesting; this method used in Foster (2000, p. 17).

[e] First year breeding observed at Red Beach.

[f] Sources for Camp Pendleton tern data: 1969 (Longhurst 1969 as cited in Minsky et al. 1985), 1970 (Craig 1971), 1971 (Swickard 1971a and 1971b), 1972 (Swickard 1972), 1973 (Bender 1973), 1974 (Bender 1974), 1975 (Massey 1975), 1976 (Bender et al. 1977 as cited in Minsky et al. 1985), 1977 (Atwood et al. 1977), 1978 (Atwood et al. 1979), 1979 (Copper 1979 as cited in Minsky et al. 1985), 1980 (Copper 1980 as cited in Minsky et al. 1985), 1981 (Belluomini 1981), 1982 (Gustafson 1986), 1983 (Minsky et al. 1983), 1984 (Minsky et al. 1984), 1985 (Minsky et al. 1985), 1986 (White et al. 1986), 1987 (Keane 1988), 1988 (Belluomini 1988), 1989 (Belluomini 1990), 1990 (Belluomini 1991a), 1991 (Belluomini 1991b), 1992 (Belluomini 1993), 1993 (Belluomini 1994), 1994 (Belluomini 1995), 1995 (Foster 1996), 1996 (Foster 1998), 1997 (Foster 1999a), 1998 (Foster 1999b), 1999 (Foster 2000), 2000 (Foster 2002), 2001 (Foster 2003a), 2002 (Foster 2004a), 2003 (Foster 2004b), 2004 (Foster 2005a), 2005 (Marschalek 2006), 2006 (Marschalek 2007), 2007 (Marschalek 2008).

[g] Sources for California Statewide tern data: 1970 (Craig 1971), 1973 (Bender 1973), 1974 (Bender 1974), 1975 (Massey 1975), 1976 (Bender et al. 1977 as cited in Minsky 1985), 1977 (Atwood et al. 1977), 1978 (Atwood et al. 1979), 1979 (Atwood 1979), 1980 (Gustafson 1986), 1981 (Gustafson 1986), Gustafson 1986), 1983 (Collins 1983), 1984 (Collins 1984), 1985 (Anon. Ukn 1), 1986 (Anon Unk 2), 1987 (Anon Unk 2), 1988 (Massey 1988), 1989 (Massey 1989), 1990 (Obst & Johnston 1992), 1991 (Johnston & Obst 1992), 1992 (Caffrey 1993), 1993 (Caffrey 1994), 1994, (Caffrey 1995), 1995 (Caffrey 1997), 1996 (Caffrey 1998), 1997 (Keane 1998), 1998 (Keane 2000), 1999 (Keane 2001), 2000 (Patton 2002), 2001 (Patton draft), 2002 (Patton draft), 2003 (Patton draft), 2004 (USFWS 2006f), 2005 (Marschalek 2006), 2006 (Marschalek 2007), 2007 (Marschalek 2008).

Table F-2 provides comparison of estimated numbers of breeding pairs in each region or colony cluster in California and on Camp Pendleton. Table F-3 provides a comparison of fledglings produced in each region or colony cluster in California and Camp Pendleton. In 2000, the nesting colony on Camp Pendleton contained approximately 24% (of the 57% in San Diego) of breeding pairs in all of San Diego County and accounts for close to 28% (of the 53% in San Diego) of fledglings produced.

TABLE F-2. REGIONAL COMPARISON FOR ESTIMATED CALIFORNIA LEAST TERN BREEDING PAIRS, 1998-2007

	2007 Min Pairs	% 2007 Total Pairs	2006 Min Pairs	% 2006 Total Pairs	2000 Min Pairs	% 2000 Total Pairs	1999 Min Pairs	% + or - 1999 to 2000	1998 Min Pairs	% + or - 1998 to 2000
San Francisco Bay & Inland	436	6.47	441	6.30	305	6.75	261	16.86	255	19.61
San Luis Obispo/Santa Barbara Co.	77	1.14	38	0.50	43	0.95	66	-34.85	58	-25.86
Ventura County	455	6.75	404	5.80	260	5.75	218	19.27	398	-34.67
Los Angeles/Orange Counties	1872	27.76	1891	27.00	1328	29.37	653	103.37	1203	10.39
San Diego County Total	3804	56.41	4232	60.40	2585	57.18	2253	14.74	2227	16.07
Camp Pendleton Only	**1422**	**21.09**	**1423**	**16.88**	**1029**	**22.76**	**672**	**53.13**	**760**	**35.39**
Total	**6744**		**8429**		**4521**		**3451**	**31.00**	**4141**	**9.18**

TABLE F-3. REGIONAL COMPARISON FOR ESTIMATED CALIFORNIA LEAST TERN FLEDGLINGS, 1998-2007

	2007 Min Fledglings	% 2007 Total Fledglings	2000 Min Fledglings	% 2000 Total Fledglings	1999 Min Fledglings	% + or - 1999 to 2000	1998 Min Fledglings	% + or - 1998 to 2000
San Francisco Bay & Inland	202	8.81	218	5.88	91	139.56	99	120.20
San Luis Obispo/Santa Barbara Co.	87	3.79	32	0.86	34	-5.88	39	-17.95
Ventura County	252	10.99	133	3.58	127	4.72	237	-43.88
Los Angeles/Orange Counties	861	37.55	1347	36.31	195	590.77	785	71.59
San Diego County Total	891	38.86	1980	53.37	224	783.93	1526	29.75
Camp Pendleton Only	**369**	**16.09**	**1025**	**27.63**	**48**	**2035.42**	**308**	**232.79**
Total	**2293**		**3710**		**671**	**452.91**	**2686**	**38.12**

F.7.3. Threats

Historically, the Least Tern was hunted for its gorgeous feathers, which were used to decorate hats during the late 19th century during the days of the thriving millinery trade. This practice resulted in the Least Terns being over hunted (UCSB 2010).

The decline in California least tern population is largely attributable to loss of nesting and foraging habitat (e.g., from construction of Pacific Coast Highway, beach homes, and other shoreline development) and disturbance to breeding colonies, including: dredging, filling, water pollution, and domestic and wild animals (USFWS 1970a, 1980). In fact, 39 animal species were reported as possible predators of least terns, which included seemingly diminutive species such as, black widow spiders and ants (Marschalek 2008).

Other natural components include storms, or environmental changes that result in lack of food, or deadly weather. Storms have been known to kill off many young terns. With recent global warming trends it is becoming more apparent that there may be an issue with local fish populations moving away from the Least Tern nesting sites, providing little or no food for the young chicks to grow strong on. There is also evidence, presented by the Audubon society, that suggest that the tern population may be shifting its nesting areas to the north to combat the issues they face through global warming. This would mean even more measures would need to be taken to protect future nesting sites from being developed (UCSB 2010).

F.7.4. Recovery Strategy Goals

The 1985 Revised Recovery Plan identified that recovery for the annual breeding population in California must increase to at least 1,200 pairs distributed in at least 20 secure coastal management areas throughout their 1983 breeding range before delisting can be considered. Each of the 20 secure management areas must have a minimum of 20 breeding pairs with a 5-year mean reproductive rate of at least 1.0 young fledged per breeding pair. Four of those colonies should be in San Francisco Bay, six in Mission Bay and six in San Diego Bay. The September 2006, 5-year review found that the gross number of CLT pairs is nearly 6 times greater than the number stated in the downlisting criterion. No other recovery goal has been fully met; there are 40 known nesting sites in California, 30 of which have more than 20 breeding pairs (USFWS 2006f).

The 1985 Revised Recovery Plan required the development and implementation of least tern management plans/programs for secure nesting habitat (secure land was defined as, land under public ownership or control that is actively managed for its resource values emphasizing endangered species) at Aliso Creek and Santa Margarita River mouth. Protection of important non-nesting, feeding and roosting habitats from detrimental land or water use changes, including the Santa Margarita River and Lake O'Neill was also required. Camp Pendleton's Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and this INRMP provide the required site-specific management, and ensure implementation of those plans and actions. However, new information about reproductive rates suggests that this particular criterion may be unnecessary for stable or increasing populations (USFWS 2006f). The status and results of the Base's management and actions in the estuarine and beach areas of the Base are reported annually to the USFWS.

F.7.5. Management

The Base has implemented focused and specific management practices for protecting the California least tern and enhancing its breeding habitat. Programmatic instructions, habitat protection and enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) guide the management of breeding habitat and foraging areas. Most of these management measures were being implemented on Base prior to the completion of the Plan in 1995, and have been incorporated in and managed through this INRMP since 2001.

Active management practices for protecting and enhancing least tern breeding habitat, and minimizing disturbance to the species when present on Base were established as early as 1984, when Camp Pendleton established protective fencing around the Santa Margarita River nesting colonies and posted warning signs to minimize human disturbance. Since then, a temporary fence is installed along all known breeding locations to protect the colonies from military training on the beach, during the breeding season. During the non-breeding season, the fences between the ocean and nesting colonies are removed to allow access to the beach for wildlife and Base operations. Ongoing management efforts include, but are not limited to, posting signs describing the restricted nature of the area, prohibiting military training and any other activity in tern colonies during breeding season (other than monitoring) between 1 March and 15 September, installation and maintenance of permanent/temporary fencing, and removal of vegetation detrimental to nesting sites. Additional proactive management practices include: monitoring, chick banding, aggressive predator control and management, annual beach habitat enhancement (exotic vegetation control and sand mobilization), annual ant control (conducted at White Beach, Cockleburr Beach and South Beach), and annual nest-monitoring to track tern population trends.

Established programmatic instructions are provided for users and residents of the Base to avoid and minimize adverse impacts to the California least tern. Environmental regulations and restrictions that apply to the least tern and other threatened and endangered species on Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and is depicted on the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to the California least tern include: 1) military activities are kept to a minimum during the breeding/nesting season (1 March – 15 September) within the Santa Margarita Management Zone and all other utilized nesting areas; 2) all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) must stay at least 300 m away from fenced or posted nesting areas; 3) aircraft are not authorized to land within 300 m of fenced nesting areas on Blue Beach or White Beach and are required to maintain an altitude of 91.4 m above ground level (AGL) or more above nesting areas; and 4) all other activities (e.g., training foot traffic) must be kept at least 5 m from these areas (see Appendix N Section 2007 and Figure 2-1).

Additionally, recreational activities are kept to a minimum during the breeding/nesting season within the Santa Margarita Management Zone and posted nest locations. Foot traffic within the management zone is prohibited within 50 m of posted nesting areas during the

breeding season. Surf fishermen are required to stay at least 91.4 m from posted nesting areas, and no live-bait fish or amphibians are allowed for use in fishing. During the breeding season, camping at Cockleburr Canyon beach is prohibited.

Action planned that supports management of the California least tern includes:

- Implement riparian BO (Section 4.3.2.1.).

F.8. COASTAL CALIFORNIA GNATCATCHER (*POLIOPTILA CALIFORNICA CALIFORNICA*)

The coastal California gnatcatcher is a small (11.43 cm, 0.2 ounce), long-tailed member of the old-world warbler and gnatcatcher family Sylviidae. The bird's plumage is dark, blue-gray above and grayish-white below. The tail is mostly black above and below. The male has a distinctive black cap, which is absent during the winter. Both sexes have a distinctive white eye-ring. As its common name implies, the gnatcatcher preys upon arthropods, including: Orthoptera, Coleoptera, Homoptera, Hymenoptera, Lepidoptera (larva) and Arachnids (Mock 2004). The coastal California gnatcatcher is most numerous in low, dense coastal scrub habitat in arid washes, on mesas, and on slopes of coastal hills. California buckwheat, coastal sage, and patches of prickly pear are particularly favored for roosting, nesting and foraging (CDFG 1997).

F.8.1. Status

The USFWS designated the coastal California gnatcatcher as threatened on 30 March 1993 (USFWS 1993a). At the time the gnatcatcher was given federal protection as a threatened species, the U.S. Secretary of Interior issued a Special Rule designed to empower a habitat-oriented conservation planning law enacted by the State of California Natural Community Conservation Planning (NCCP) process (USFWS 1993a). The objectives of the NCCP program involve working with local governments and landowners to identify and protect habitat in sufficient amounts and distribution that will enable long-term conservation of the coastal sage scrub community, as well as other sensitive habitat types (CDFG 2009a).

The USFWS designated critical habitat for the coastal California gnatcatcher in 2000 in the southern California ecoregion, which included federal lands (USFWS 2000b). The USFWS concluded that the benefits of excluding Camp Pendleton from critical habitat designation exceeded the benefits of including the Base under Section 4(b)(2), to ensure that mission-critical military training activities can continue without interruption at Camp Pendleton. This exclusion did not include the portion of the Base leased to California State Parks (San Onofre State Beach). Following this designation of critical habitat for the coastal California gnatcatcher, a complaint was filed in U.S. District Court challenging the USFWS's exclusion of some lands from the designation of critical habitat, and the methodology used by the Service in the economic analysis of the designation of critical habitat. On 11 June 2002, the U.S. District Court granted the Service's request for a remand of the coastal California gnatcatcher critical habitat designation, so that the economic impact associated with designating any particular area as critical habitat could be reconsidered. The Court directed that a new rule be proposed by 11 April 2003, and that existing critical habitat designated should remain in place until such time as a new, final regulation becomes effective. The revised proposal for critical habitat designation was published 24 April 2003.

In the revised proposed rule, mission-essential training areas on Camp Pendleton were considered, but not proposed as critical habitat for the coastal California gnatcatcher under Section 4(b)(2) of the ESA. Non-training areas on Base were proposed as critical habitat for the gnatcatcher as part of Unit 6: Southern NCCP Subregion of Orange County and MCB Camp Pendleton. These areas included lands within the Wire Mountain housing area, De Luz housing area, and State Park leased lands (e.g., San Onofre State Beach) (USFWS 2003b). On 18 January 2008, a final ruling for California gnatcatcher critical habitat was published (CDFG 2008a). This final determination provides an exemption from critical habitat designation on all MCB Camp Pendleton lands, including San Onofre State Beach. The USFWS found that, after review and approval of the Base's 2007 INRMP, under section 4(a)(3)(B) of the Sikes Act it provides a sufficient benefit to the species and its habitat on Base lands to qualify for exemption status.

Currently, a recovery plan for the coastal California gnatcatcher has not been developed.

F.8.2. Distribution and Occurrence

The coastal California gnatcatcher is a non-migratory bird with a range restricted to California and Baja California, Mexico. This subspecies is found from Ventura County south to San Diego County and east to San Bernardino County. On Camp Pendleton, the coastal California gnatcatcher's distribution is markedly clumped, with concentrations in the northern (State Beach), coastal, and southern (inland) portions of the Base (Figure 3-13). It occurs almost exclusively in the coastal sage community, but can also be found in chaparral and riparian habitats. The gnatcatcher breeding season extends from 15 February through 30 August, with peak nesting activities occurring from mid-March through mid-May (Griffith Wildlife Biology 2004a).

Over the years, survey efforts on Base have resulted in an increase in known gnatcatcher locations. Although early surveys for gnatcatchers were often incomplete and not comparable (e.g., 1989 did not conduct replicate surveys at each site, 1993 and 1994 surveys did not include the State Beach, and the 1995 survey focused primarily on the State Beach), a basewide survey in 1998 appears to exhibit a peak number of 620 gnatcatchers pairs (Table F-4). In this table, in order to increase comparability of the 1994/95 data (which combined was roughly equivalent to a basewide survey) to the 1998 basewide survey, juveniles were dropped from the 1994 count (providing a total of 479 adults), and each adult sighting in 1994 and 1995 was assumed to be a pair. Although there was slight overlap between the 1994 and 1995 survey regions, simple addition of the two years yields a basewide total of 574 adult pairs for 1994/95. Thus, the 1998 survey results represented an estimated 8% increase in gnatcatcher pairs since 1994/95. In 2003, however, a basewide survey located 316 sites occupied by adult gnatcatchers, including 286 confirmed pairs (Griffith Wildlife Biology 2004b). The 2003 survey represents an observed decline of 54% in adult pairs from 1998; however, if it is assumed that all 316 sites were actually occupied by a pair, which is what Atwood et al. (1999) assumed in 1998, then the observed decline is actually 49%. The observed decline in gnatcatchers is likely due to a combination of factors, including an actual decrease in the gnatcatcher populations on Base, as well as, a result of different survey methodologies between 1998 and 2003.

Surveys were conducted in suitable scrub habitat within the defined study area of each effort. By placing a 152.4 m radius buffer around each 1998 coastal California gnatcatcher GIS point and removing overlapping buffers and off-Base areas, approximately 3,343 ha on Base are estimated to be occupied by the coastal California gnatcatcher. The distribution of coastal California gnatcatchers across the Base (excluding the State Park lease area) during 1994 and 1998 was similar. The 1998 population of gnatcatchers on Camp Pendleton accounted for 18% of the San Diego County population and 30.8% of North County population (SANDAG 2009a). The 2003 basewide survey found 286 pairs of California gnatcatchers (Griffith Wildlife Biology 2004a). A summary of the coastal California gnatcatcher surveys on Camp Pendleton is shown in Table F-4.

The influence of fire on California gnatcatcher population dynamics was studied on Camp Pendleton from 1999 to 2001 (Atwood et al. 2003). Distribution surveys were conducted within 50 focal study plots, each defined by a 1.2 km diameter circle or 113 ha study area (5,647.6 ha total study area). Plots were characterized as OLD (mean number of years since last fire ≥ 20), MIDDLE-AGED (mean number of years since last fire < 20 and ≥ 10), or YOUNG (mean number of years since last fire < 10) according to their fire history, as mapped in 1996 by the Base GIS. Pair locations were similarly classified according to the GIS fire history.

TABLE F-4. SUMMARY OF COASTAL CALIFORNIA GNATCATCHERS ON CAMP PENDLETON (1989-2010)

Survey Year	Number of Pairs	Total Sightings (including pairs, single adults, and juveniles)	Source/Comments
1989/90[a]	175	Not reported	Tutton (1991) Reported 169 pairs; 6 additional incidental observations of gnatcatchers were made by Griffith Wildlife Biology in 1990.
1993	155	275	Griffith Wildlife Biology 1997a[c].
1994[b]	388	554	Griffith Wildlife Biology 1997a[c].
1995[b]	95	N/A	FTC study; primarily State Park lease area only.
1998[d]	620	Not reported	Atwood et al. 1999.
2003	286	316 (adult only)	Griffith Wildlife Biology 2004a.
2006	642	805	Griffith Wildlife Biology 2008a. Includes: 642 breeding pairs, 26 single males, 80 juveniles, and 57 post-breeding-season locations.
2010	268	390	Tetra Tech, Inc. 2010. Includes: 268 occupied sites (47 territorial males, 173 pairs, and 48 family groups [with 66 dependent juviniles]) and 56 transient individuals.

[a] 1989 survey effort did not include repeat/replicate visits to sites due to funding constraints.
[b] 1994 and 1995 surveys were somewhat complementary in the areas covered; a quasi total for comparability with 1998, yields 574 adult pairs for 1994/95 (see text for explanation).
[c] 1993 and 1994 surveys excluded State Park lease area.

[d] Atwood et al. 1999 reported 604 distinct locations (presumed to be pairs, juveniles were not reported). However, based on the GIS layer for that year and an email from Atwood (4-20-99), the actual count is 620 distinct locations. The 16 missing points were in the Uniform Area.

Censuses conducted on the study plots found 220 pairs in 1999, but only 51 and 50 pairs, respectively, during 2000 and 2001. According to Atwood et al. (2003), the population decline that occurred between 1999 and 2000 was not likely caused by human disturbance or habitat loss. Similar population declines have been noted before in southern California, and likely are related to various natural factors, such as mortality resulting from poorly understood interactions of winter rainfall and temperature. However, further research is needed to determine the cause of the apparent decline (Atwood et al. 2003).

When the 1999–2000 population decline occurred, declines were more profound in areas dominated by younger habitat. In 1999, 13% of the total pairs were located in areas that had burned <10 years previously; in 2000 and 2001, 0% and 6% respectively, of all surviving pairs were located in areas of younger habitat. In other words, although gnatcatchers may occur in areas of younger habitat during periods of high population levels, at low populations they persist mostly in areas that have not burned for 20 years or more. Maintenance of some "old growth" areas of coastal sage scrub may be essential to the long-term persistence of a population on Base. For a regional comparison with the number of known gnatcatcher sites on Camp Pendleton, Table F-5 identifies known California gnatcatcher sites in southern California (Atwood et al. 2003).

A total of 344 California gnatcatcher nests were found and monitored within the focal study plots during the 1999-2000 study (Atwood et al. 2003). Nests located in areas mapped as having burned within 10 years had significantly higher rates of daily nest survivorship than nests located in older habitats. Thus, although fewer pairs of gnatcatchers occurred in areas of younger habitat, those that did occur often had higher rates of reproductive success than pairs located in older areas. Differences in predator communities among variously aged habitat may explain this observation, but more research is needed (Atwood et al. 2003).

TABLE F-5. REGIONWIDE SUMMARY: STATUS OF CALIFORNIA GNATCATCHER SITES WITHIN KNOWN RANGE IN SOUTHERN CALIFORNIA (MODIFIED FROM TABLE 4-1 OF COREY ET AL. 2003)

Regional Major Population Area(s)	Number of Counted Gnatcatcher Sites
San Diego MSCP	1,819
North San Diego County MHCP	378
Central/Coastal NCCP Reserve	340
Central/Coastal Special Linkage, NRPPA, Exiting Use Area and Non-Reserve Open Spaces	140
Protected Gnatcatcher Sites in Southern Orange County Subregion NCCP (Conservation Easements)	348
Unprotected Sites in the Southern Subregion NCCP	389
Palos Verde Peninsula, Los Angeles County	38
Approximate Total Sites in NCCP/HCP Planning Areas	***3,452 sites***

Gnatcatcher Sites Located On Federal Lands	
MCB Camp Pendleton	620
MCAS Miramar	53
Total Gnatcatcher Sites On Federal Lands	***673 sites***

Gnatcatchers Within Areas Not Covered by 4(D) Rule Protection, but Subject to Section 9 ESA Protections	
Riverside County	326
Los Angeles County	97
San Bernardino County	27
Ventura County	12
Total Gnatcatcher Sites Subject to Section 9	***462 sites***

Gnatcatcher Sites in NCCP/HCP Planning Areas, Federal Lands or Subject to Section 9 ESA Protections	
Gnatcatcher Sites in NCCP Planning Areas	3,445
Gnatcatcher Sites on Federal Lands	673
Gnatcatcher Sites Subject to Section 9 Protections	462
Gnatcatcher Sites Not Authorized for Take	***4,580***
Gnatcatcher Sites Authorized for Take by Approved NCCPs	***1,103***
GRAND TOTAL	**5,683**

From 2003 to 2006 the number of gnatcatcher territories on Base increased by 2.5%; 805 sites occupied by gnatcatchers were identified, including 642 breeding pairs, 26 single males, 80 juveniles, and 57 post-breeding-season locations. Based upon the 2006 and past results, it appears that elevation, slope, and fire history may play important roles in gnatcatcher distribution. Only 44/805 (5%) gnatcatcher territories were located above 150 m (only half of which were pairs). Only 21 sites (6 pairs) were found above 175 m, and only 8 sites (1 pair) were above 225 m. Only 11 gnatcatchers were found on slopes of greater than 15%, and none on slopes greater than 22%. Most of the 2006 gnatcatcher territories (61%) were located in areas that have not burned at least since 1973, and 94% were found in areas that burned ten or more years ago. In sum, most gnatcatchers at Camp Pendleton are found at elevations below 150 m, on less than 15% slopes, in areas that have not burned in ten or more years, and in the same general areas as in years past. Despite typical annual fluctuations, the California gnatcatcher population at Marine Corps Base Camp Pendleton is gradually increasing over time [1989-2006 (r = 175-642, avg = 363)] primarily within previously identified core areas; it is speculated that with continued habitat protection, cowbird control, and impact avoidance, this trend will continue because there is suitable vacant habitat available (Griffith Wildlife Biology 2008a).

F.8.3. Threats

Although numerous factors were involved in the decline of the coastal California gnatcatcher, habitat loss and fragmentation resulting from urban and agricultural development, and the synergistic effects of cowbird parasitism and predation (USFWS 2003b) are the principal reasons for the species' current threatened status. Agricultural use,

urbanization, increased fire frequency, and introduced exotics have adversely impacted extant sage scrub habitat.

F.8.4. Recovery Strategy Goals

Even though there is no recovery plan for the coastal California gnatcatcher, Camp Pendleton continues to support protecting and improving gnatcatcher habitat basewide. As of 2006, habitat on Camp Pendleton supported at least 642 breeding pairs of adult gnatcatchers (Griffith Wildlife Biology 2008a).

F.8.5. Management

The Base is in consultation with the USFWS regarding upland habitats basewide including the gnatcatchers preferred habitat of coastal sage scrub. Until the Uplands BO is issued, the gnatcatcher benefits from current basewide management practices. These management measures include: 1) exotic vegetation control (Section 4.4.1.3.); 2) exotic animal control (Section 4.3.3.2.); 3) investigative research (e.g., to determine effects of wildfire on gnatcatcher habitat quality and distribution, see Section 4.3.3.6.); 4) CSS mitigation areas (De Luz housing area [8-acres] and Pio Pico [8.1 ha site]); and 5) habitat enhancement by utilizing native seed stock in restoration and recovery measures.

Environmental regulations and restrictions that apply to the coastal California gnatcatcher and its habitat on Base are provided for all users of ranges and training areas in the form of programmatic instructions. These programmatic instructions are used to guide training activities and protect natural resources, species and related habitat areas. Programmatic instructions for each training area and range are published in Base Order P3500.1N (*Range and Training Regulations*), and are depicted on the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to the coastal California gnatcatcher include: 1) during the gnatcatchers' breeding season, training units in occupied habitat are to avoid creating loud noises, smoke, fires, and concentrations of personnel; 2) during the breeding season, foot traffic and vehicles/equipment are to be kept on existing roads in occupied habitat; 3) bivouac/command post/field support activities are kept at least 300 m from gnatcatcher habitat areas year-round; and 4) foot traffic may be authorized in gnatcatcher habitat between 16 August and 31 January and vehicles/equipment may leave existing roads, as long as brush is not removed or crushed (see Appendix N Section 2007 and Figure 2-1).

Gnatcatchers are surveyed basewide every three to four years.

A planned action that supports the management of the California gnatcatcher includes:

- Implement uplands species habitat conservation plan (Section 4.3.2.2.).

F.9. LEAST BELL'S VIREO (*VIREO BELLII PUSILLUS*)

Least Bell's vireos are small birds about 11.4 to 12.7 cm long. They have short rounded wings, short straight bills, and a faint white eye-ring. Least Bell's vireo feathers are mostly gray above and pale below; seen from below the bird blends into the clouds, and from

above, they blend into the land-cover (USFWS 2008c). The species inhabits low, dense riparian growth along water or along dry parts of intermittent streams typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities. The Least Bell's vireo builds an open-cup nest typically out of pieces of bark, fine grasses, plant down, and horse (mammal) hair. Nests are often placed on a slender branch of a small tree or shrub ranging from 0.3-3 m (typically 0.6-0.9 m) above the ground. Peak egg laying is May into early June; clutch size averages 3 to 4 eggs and the incubation period is typically 14 days, shared by both sexes. Both sexes care for altricial young, which usually fledge 11-12 days after hatching (CDFG 1997b & Rourke and Kus 2007).

F.9.1. Status

The USFWS listed the Least Bell's vireo as an endangered species on 2 May 1986 (USFWS 1986b). Results of a 5-year review by the USFWS recommended to downlist the species from endangered to threatened status on 14 February 2007, however, this action has not been finalized (CDFG 2008a). Critical habitat for the Least Bell's vireo was designated in 6 southern California counties on 2 February 1994 (USFWS 1994a); Camp Pendleton was excluded from this designation due to a Memorandum of Understanding (MOU) with the USFWS. A draft recovery plan was released by the USFWS on 6 May 1998, however, a final recovery plan is still pending (USFWS 1998c).

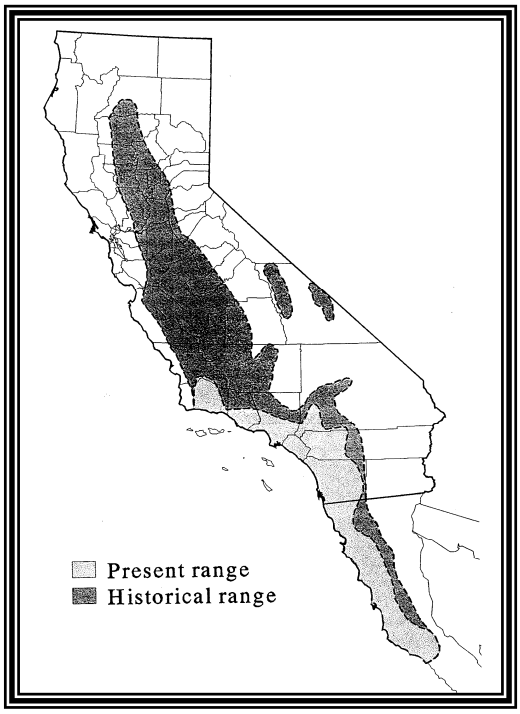

FIGURE F-9. PRESENT AND HISTORIC RANGE OF LBV
(SOURCE: USFWS 1998c)

F.9.2. Distribution and Occurrence

Formerly common and widespread within lowland riparian systems in California and northwestern Baja California, the Least Bell's vireo population began decling in the late 1900's and was reduced to about 300 pairs by 1986 (Figure F-9). The vireo's dramatic decline was due to widespread loss of low elevation riparian habitat combined with range expansion by the brown-headed cowbird (*Molothrus ater*), a persistent brood parasite of open-cup nesting songbirds, and the introduction of invasive exotic plant species, such as giant reed (*Arundo donax*). After active management measures (namely cowbird control and habitat conservation) were instituted in the early 1980s, the vireo population increased to an estimated 600 pairs by 1991 (Pavelka 1994 & USGS 2008b). In 1996, the population in southern California grew to 1,346 pairs and in 2001, 2,443 territories were confirmed in southern California (Corey et. al 2003). In 2005, the population continued to grow to 2,968 confirmed territories in southern California (USFWS 2006e). In San Diego County, 1,609 vireo territories were estimated between 2001-2005, with approximately 50% or more from Camp Pendleton (USFWS 2006e). As of 2006, the

Statewide vireo population was estimated at 2,500 territories, roughly a third of which occurred on Base (USGS 2008b).

The Least Bell's vireo arrives at breeding grounds on Camp Pendleton from mid-March to early April, and then they typically return to their wintering grounds in southern Baja California in late September, although they may begin departing as early as late July (Franzreb 1989 & USFWS 1998c). Vireos primarily inhabit dense willow-dominated riparian habitats with lush understory vegetation. They nest 0.9-1.2 m above the ground in dense understory and use taller trees for foraging and singing perches (Salata 1981). The Least Bell's vireo forages primarily in willows; however, vireos nesting on the edge of riparian habitat or in riparian corridors less than 45.7 m wide have been observed foraging up to 54.9 m away from the willow-riparian edge in coastal sage scrub and chaparral (Kus & Miner 1989). Home ranges of vireos in the Santa Margarita River habitat varied from less than 0.2 ha to over 3.6 ha (mean 1.07 ha) in 1988; a majority were between 0.4 and 1.0 ha (Jones 1989). A summary of territorial male Least Bell's vireos observed in various drainages on Camp Pendleton between 1979 and 2008 is shown in Table F-6. Figure 3-15 illustrates the general distribution of the Least Bell's vireo on Base.

TABLE F-6. NUMBER OF TERRITORIAL MALE LBVS ON DIFFERENT DRAINAGES AT CAMP PENDLETON, 1978 TO 2010

	DRAINAGES[c]															
Year	**SMR**	**CC**	**SMC**	**SOC**	**PDL**	**LFC**	**AC**	**FC**	**DLC**	**FBC**	**PBC**	**WC**	**PC**	**MIS**	**TOTAL**	**STATE WIDE (CA) Total**
1978[b]	5		0			0									5	
1980[b]	14		1	0		0			0				0		15	
1981	26		0	0		1			0						27	300
1982	43		0	0		2			0						45	
1983	60		0	0		1			1						62	
1984	83		0	0		0			0						83	
1985	86					0			1						87	285
1986	98		0	0		0			2						100	300
1987	151		3	0		4		0	3				4		165	
1988	200		1	0		3		0	2	0			4		210	456
1989	154		0	0		5		0	2	0			11		172	
1990	189		1	0		8	0	0	0	0			11		209	289
1991	212		1	1		22	2	1	3	0			14		256	
1992[a]	194	0	2	0	1	9	2	0	2	1		0	13		224	
1993	319	0	4	3	0	59	5	1	3	6	0	0	20		420	500
1994[a]	336	0	5	7	0	50	9	4	9			0	28	0	448	927
1995	426	0	17	15	1	125	12	7	24	11		0	44	5	687	
1996	523	5	48	27	1	148	24	10	26	16	2	2	48	22	902	1,346
1997	540	4	51	30	1	164	19	9	24	2	3	1	61	26	935	
1998	567	3	55	40	9	157	22	6	15	15	6	5	68	43	1,011	
1999	486	11	63	44	8	126	18	6	18	18	3	8	42	34	885	
2000	440	9	56	40	3	112	23	7	22	14	3	7	35	36	807	
2001	458	8	56	27	3	111	25	6	18	11	3	6	23	28	783	2,000
2002	382	7	55	47	6	137	22	6	18	10	2	3	34	37	766	2,443

	DRAINAGES[c]															
Year	**SMR**	**CC**	**SMC**	**SOC**	**PDL**	**LFC**	**AC**	**FC**	**DLC**	**FBC**	**PBC**	**WC**	**PC**	**MIS**	**TOTAL**	**STATE WIDE (CA) Total**
2003	402	10	44	23	3	99	21	5	23	17	2	8	16	45	718	
2004	440	8	68	56	5	84	21	5	26	16	3	18	38	35	823	2,500
2005	462	6	56	52	8	85	21	6	18	20	5	12	36	40	827	2,968
2006	405	8	59	43	9	76	11	4	25	10	3	7	23	35	718	2,500
2007	411	8	46	44	6	81	9	2	24	9	2	8	26	31	707	
2008	463	4	53	41	3	70	11	2	25	11	2	12	26	15	738	
2009	592	13	83	62	5	107	2	2	39	11	1	13	27	56	1,013	
2010	678	10	71	54	6	124	16	2	34	15	0	10	24	24	1,068	

[a] Comprehensive surveys were not performed in 1992 and 1994.

[b] Cursory walk by surveys in 1978 and 1980.

[c] Drainages: Santa Margarita River (**SMR**), Christianitos Creek (**CC**), San Mateo Creek (**SMC**), San Onofre Creek (**SOC**), Piedre de Lumbre (**PDL**), Las Flores Creek (**LFC**), Aliso Creek (**AC**), French Creek (**FC**), De Luz Creek (**DLC**), Fallbrook Creek (**FBC**), Pueblitos Canyon (**PBC**), Windmill Canyon (**WC**), Pilgrim Creek (**PC**), and Miscellaneous (**MIS**). Blank cells represent no survey performed.

[d] Sources for Camp Pendleton vireo data: 1978 (Goldwasser 1978), 1980 (Salata 1980), 1981 (Salata 1981), 1982 (Salata 1983a), 1983 (Salata 1983b), 1984 (Salata 1984), 1985 (Salata 1986), 1986 (Salata 1987a), 1987 (Salata 1987b), 1988 (Jones 1989), 1989 (Griffith Wildlife Biology 1990), 1990 (Griffith Wildlife Biology 1991), 1991 (Griffith Wildlife Biology 1992), 1992 (Sweetwater Environmental Biologists, Inc. 1993), 1993 (Pavelka 1994), 1995 (Kus 1996), 1996 (Griffith Wildlife Biology 1997b), 1997 (Griffith Wildlife Biology 1998), 1998 (Griffith Wildlife Biology 1999a), 1999 (Griffith Wildlife Biology 1999b), 2000 (Griffith Wildlife Biology 2000), 2001 (Griffith Wildlife Biology 2001), 2002 (Griffith Wildlife Biology 2005a), 2003 (Griffith Wildlife Biology 2003), 2004 (Griffith Wildlife Biology 2004b), 2005 (Rourke and Kus 2006), 2006 (Rourke and Kus 2007), 2007 (Rourke and Kus 2008), 2008 (USGS 2009a), 2009 (USGS 2009b) & 2010 (USGS 2010b).

[e] Sources for California Statewide vireo data: 1981 (Salata 1981), 1985 (Griffith Wildlife Biology 1990), 1986 (USFWS 1986b), 1988 (Jones 1989), 1990 (Griffith Wildlife Biology 1990), 1993 (USFWS 1994a), 1994 (Kus 1996), 1996 (USFWS 1998c), 2000 (USFWS 2002c), 2001 (Corey et al. 2003), 2005 (USFWS 2006e), & 2006 (USGS 2009c) .

Population trend data indicates a possible on Base vireo carrying capacity of between 700 and 1,000 territories, which is most likely influenced by the annual variability in a number of biotic and abiotic factors, such as changes in precipitation, temperature, and prey availability (Rourke and Kus 2006).

In 2010, the number of documented Least Bell's Vireo territories (1,068) exceeded the highest recorded number of vireo territories on MCBCP over the past 15 years. The number of territories on 26% (6/23) of drainages surveyed increased from 2009, while nine drainages showed no change or decreased by two or fewer territories. Overall, the vireo population on Base increased by 5% from 2009 to 2010 (USGS 2010b).

Exotic vegetation on Base was widespread and is a potential issue of concern since its impact(s) on least Bell's vireo abundance, distribution and nest success are not well understood. Recent data indicates that the Least Bell's vireo is using exotic vegetation less

often for nesting on Base since 2005. This is potentially attributed to less exotic vegetation available for nesting due to exotic removal efforts, and/or increased abundance of high quality native habitat available for nesting due to a decreased population of the species present (Rourke et al. 2006).

FIGURE F-10. BROWN-HEADED COWBIRD
(PHOTO SOURCE: LEE KARNEY, USFWS)

F.9.3. Threats

The regional decline in Least Bell's vireos is attributed to permanent or long-term loss and degradation of nesting habitat and riparian woodlands due to urban development, human disturbance, and nest parasitism by cowbirds (USFWS 1986b).

Active management for the Least Bell's vireo on Camp Pendleton began in 1981. A cowbird live-trapping and removal program was first initiated in 1983 with 5 traps on the Santa Margarita River. The cowbird control program expanded to 33 traps basewide by 1994 and to 40 traps basewide in 2000. Since cowbird control began, the number of vireo locations at Camp Pendleton has increased from 62 to over 1,000 in 1998 (Griffith Wildlife Biology 2000a). Additionally, the incidence of nest parasitism dropped from 47% in 1982 to 3.3% in 1986 (Beezley and Rieger 1986). As the trap design was improved and the number of traps increased, the incidence of cowbird nest parasitism continued to decline and reached 0.5% in 1990. According to Kus and Whitfield (2005), annual productivity of vireos increased by one young for each 30% drop in parasitism frequency. A summary of the number of brown-headed cowbirds captured on Camp Pendleton between 1983 and 2004 is shown in Section 4.3.3.2., Table 4-3.

In a 2000 study (Peterson et al. 2004), species-specific predators of the Least Bell's vireo were monitored in the spring and summer of 2000. Three methods were used to determine nest predators of the vireo: fixed radius (100 m) point counts, tracking stations (10 stations), and video photography. The study area encompassed a 5 km section of the San Luis Rey River and a 2-km reach of one of its tributaries, Pilgrim Creek, in northern San Diego County, California. Five potential predators were recorded at tracking stations, including: coyotes, striped skunks, Virginia opossums, long-tailed weasels, and greater roadrunners. Of these, the coyote was most abundant and present at all tracking stations. Five potential avian predators were recorded at point count locations: yellow-breasted chats, western scrub-jays, American crows, common ravens, and Cooper's hawks. Video cameras placed on 25 nests documented 12 predation events (48% of total), including eight by scrub jays (67%), two by opossums (17%), one by a gopher snake (8%) and one by Argentine ants (8%). Expansion of the Argentine ant population in association with ongoing urban development may constitute a previously unrecognized predation threat to the vireo, but further study is needed to determine their significance (USFWS 2006e).

F.9.4. Recovery Strategy Goals

A draft recovery plan for the Least Bell's vireo was published in March 1998 (no final recovery plan available to date) (USFWS 1998c). This plan established draft recovery criteria for the vireo and identified one criterion to be met for a period of five years before the species will be considered for reclassification from endangered to threatened. The criterion is:

- Stable or increasing Least Bell's vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, are protected and managed at the following sites: Tijuana River, Dulzura Creek/Jamul Creek/Otay River, Sweetwater River, San Diego River, San Luis Rey River, Santa Margarita River, Santa Ana River, an Orange County/Los Angeles County metapopulation, Santa Clara River, Santa Ynez River, and an Anza Borrego Desert metapopulation.

Delisting may be considered when the species meets the criterion for downlisting and the following two criteria have been met for five consecutive years:

- Stable or increasing Least Bell's vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, have become established and are protected and managed at the following sites: Salinas River, a San Joaquin Valley metapopulation, and a Sacramento Valley metapopulation.
- Threats are reduced or eliminated so that Least Bell's vireo populations/metapopulations listed above are capable of persisting without significant human intervention, or perpetual endowments are secured for cowbird trapping and exotic plant (Arundo) control in riparian habitat occupied by Least Bell's vireros.

The 1998 draft recovery plan also identifies management measures or activities which need to be initiated or improved to achieve management goals. Management measures identified for the Least Bell's vireo at locations on Camp Pendleton/Santa Margarita River consist of the following: 1) protect existing and historic habitat; 2) develop a management plan; 3) assess major threats such as fire and fire prevention, land clearing, water management, military training activities, groundwater pumping and wastewater treatment, flood/sediment control and exotic species; 4) conduct annual surveys that provide estimates of population size and trends, demographic parameters and habitat characteristics; 5) cowbird control through trapping adults and juveniles; and 6) conduct plant and exotic vegetation control (castor bean, cockleburr, tamarisk and giant reed). As of 2006, the Base supported at least 718 singing male Least Bell's vireos (Rourke and Kus 2007). The management program in this INRMP accomplishes the management measures identified in the recovery plan for Least Bell's vireo habitat on Base.

F.9.5. Management

The Base has implemented management programs for protecting the Least Bell's vireo and enhancing vireo-breeding habitat. Management efforts are guided by the Riparian Ecosystem Conservation Plan (Appendix B) and under this plan Camp Pendleton maintains a minimum baseline of 485.6 ha and at least an additional bank of 404.7 ha of riparian

habitat to support the Least Bell's vireo and other riparian species. The Least Bell's vireo management measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since the completion of the Plan in 1995 and were incorporated in and have been managed through this INRMP since 2001.

Under a 31 July 2006, MOU between the USFWS and the Department of Defense (DOD), the vireo, as a migratory bird species, will receive certain benefits on DOD lands under the MBTA (USFWS 2006e). Current basewide management practices that benefit the vireo directly and indirectly include: 1) annual monitoring of population levels and distributions of the endangered Least Bell's vireo; 2) incorporating survey data into the GIS species distribution database to update Environmental Operations Maps and to utilize in conservation awareness and education programs (see Section 4.3.8.); 3) exotic vegetation control including *Arundo* and *Tamarix* spp. removal and control (see Section 4.4.1.3. and Tables 4-7 and 4-8); 4) exotic animal control (annual cowbird control activities; see Section 4.3.3.2. and Table 4-3); 5) established programmatic instructions that limit impacts to LBV and its habitat; and 6) groundwater levels monitored and basin withdrawals managed to avoid loss and degradation of habitat quality.

Environmental regulations and restrictions that apply to the Least Bell's vireo are provided to all users of ranges and training areas to guide training activities and protect this species and its habitat. Natural resource, species, and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and is depicted on the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions that have been instituted to avoid impacts to the Least Bell's vireo and its habitat include: 1) restricting vehicle movement in riparian areas to existing roads; 2) keeping helicopter operations above 61 m AGL over riparian areas (except when landing or taking off between 15 March and 31 August); and 3) limiting ground troop movements in riparian areas to existing roads, trails, and crossings during the breeding season and prohibiting bivouacking in riparian areas. See Appendix N (Section 2007 and Figure 2-1).

Action planned that supports management of the Least Bell's vireo includes:

- Implement riparian BO (Section 4.3.2.1.).

F.10. LIGHT-FOOTED CLAPPER RAIL (*RALLUS LONGIROSTRIS LEVIPES*)

FIGURE F-11. LIGHT-FOOTED CLAPPER RAIL
(PHOTO SOURCE: USFWS 2009H)

The light-footed clapper rail is an approximately 35.6 cm long marsh bird that has long dull yellowish-gray legs and toes (USFWS 2008d & 2009j). It has a slightly down-curved beak and a short, upturned tail. Males and females are identical in plumage with a cinnamon breast contrasting their streaked back plumage of grayish-brown, and barred flanks of gray and white (USFWS 2008d). The chin, throat, and a line from the base of the bill to the top of the eye are very light-buff (USFWS 2009j).

Light-footed clapper rails are omnivorous and opportunistic feeders. Their diet is thought to consist of spiders, tree-frog tadpoles, beetles, isopods, crayfish, bivalve mollusks, garden snails, California hornsnails, salt marsh snails, mullet (deceased), fiddler and hermit crabs, and California killifish. California meadow mice (*Microtus californicus*) are also thought to be prey. Rails ingest some vegetable matter such as, broken *Spartina* stems and *Salicornia* tips, as well (USFWS 1985b). Preferred marsh vegetation varies from salt marshes heavily dominated by pickleweed (*Salicornia virginica*) to freshwater marshes dominanted by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) with occasional intermixed willows (*Salix* spp.) (USFWS 1985b). In addition, scattered stands of spiny rush (*Juncus acutus* ssp. *leopoldii*) are critical for rail nest placement (Zembal & Hoffman 2000).

The pair bond among light-footed clapper rails endures throughout the breeding season, and typically from year-to-year. Nesting usually begins in March, and late nests hatch by August. Nests are placed to avoid flooding by tides, yet in dense enough cover to be hidden from predators and to support the relatively large nest. Typically nests in *Spartina* are elevated 10 to 46 cm above the ground. The outside edges of nesting platforms are typically woven into the surrounding live cordgrass which secures the nest as it floats during high tide. Nests typically include one or two ramps of vegetation leading to the ground, and a loosely-woven canopy of live stems and leaves. Females lay approximately 4 to 8 eggs, which hatch in 18 to 27 days. Both parents care for the young; one forages, while the other adult broods the chicks. In addition to the primary nest site where eggs are incubated, a brood nest is constructed after the young have hatched (USFWS 2009j).

F.10.1. Status

The light-footed clapper rail was federally listed as an endangered species by the USFWS on 13 October 1970 (USFWS 1970b), and as a State endangered species by the CDFG on

27 June 1971 (CDFG 2008a). No critical habitat has been designated for this species by the USFWS; however, a recovery plan is available (USFWS 1985b).

F.10.2. Distribution and Occurrence

The light-footed clapper rail is a non-migratory bird found in coastal freshwater and saltwater marshes in southern California and northern Baja California, Mexico. The light-footed clapper rail is found in only a fraction of the marshes it once occupied. The rail has been absent from Los Angeles County since 1983 and Santa Barbara County since 2004. The majority of light-footed clapper rails, about 60% of the State breeding population, reside in the Upper Newport Bay Ecological Reserve in Orange County (Zembal & Hoffman 2000 & USFWS 2009j).

The population and distribution of the clapper rail in California has varied over the years. Breeding season typically occurs from mid- to late-March into mid-August. A census is conducted annually by call counts in thirty coastal wetlands from Goleta Marsh in Santa Barbara County, south to the Tijuana Marsh on the Mexican border (Table F-7). The steadily increasing population of light-footed clapper rails since 2000, shown in Table F-8 below, is attributed to management efforts and major habitat restoration projects; it is speculated that a significant increase in such activities may potentially lead to the recovery of the species (Zembal, Hoffman & Konecny 2007).

Table F-7 Population and Distribution of Light-Footed Clapper Rails, 1980-2007

Year	Breading Pairs	Marshes Distributed In
1980[a]	203	11
1981[f]	173	15
1982[f]	221	18
1983[f]	249	18
1984[f]	277	19
1985[f]	142	14
1986[f]	143	12
1987[f]	178	11
1988[f]	177	14
1989[f]	163	8
1990[f]	189	9
1991[f]	235	11
1992[f]	275	13
1993[f]	300	13
1994[f]	288	11
1995[f]	262	14
1996[a]	325	15
1997[f]	307	16
1998[f]	222	17
1999[f]	233	14
2000[a]	253	16
2002[b]	274	16
2003[c]	284	16

2004[d]	350	15
2005[e]	360	16
2006[d]	408	18
2007[f]	443	19

[a] (Zembal & Hoffman 2000).
[b] (Zembal & Hoffman 2002).
[c] (Zembal & Hoffman 2004).
[d] (Zembal, Hoffman & Konecny 2006a).
[e] (Zembal, Hoffman, Konecny & Collins 2005).
[f] (Zembal, Hoffman, Konecny, Gailband, Conrad & Mace 2008).

In 1998, a wetland aviary was developed at the Chula Vista Nature Center (CVNC) to house clapper rails for captive propagation (Zembal & Hoffman 2002). The clapper rails bred successfully there for the first time in 2001, after switching mates with another pair. Each pair laid a single clutch, one of 8 and the other of 7 eggs. The eight-egg clutch was taken to Sea World to be hatched and reared. During the 2002 nesting season, there were three pairs of captive rails at CVNC and a lone male at Sea World. The three pairs produced five clutches of eggs in 2002. At seasons end 21 clapper rails were bred successfully in captivity, 4 of which were released at the Sweetwater Marsh National Wildlife Refuge, 6 at the Seal Beach National Wildlife Refuge, and 11 at Point Mugu. San Diego Zoo's Wild Animal Park also is utilizied for captive propagation. To date the captive breeding program has released 164 captive-reared birds into ten different marshes in California; eggs have also been successfully translocated from Upper Newport Bay to the Mugu Lagoon when nesting attempts between the two sites were synchronous (USFWS 2009j).

A total of 443 pairs of light-footed clapper rails exhibited breeding behavior in 19 marshes in 2007. This is an 8.3% increase over the former high count in 2006 and a 36% increase over the longer standing high in 1996. This is the fourth consecutive year of record-breaking high counts. The subpopulation in Upper Newport Bay was once again the largest in California and was only 9 pairs lower than its record high in 2005. The Tijuana Marsh NWR subpopulation reached a record level with 142 pairs, a 39.2% increase over its former high set in 2006. The Newport subpopulation comprised 37.3% of the State total in 2007 and the Tijuana Marsh NWR subpopulation comprised 32.1%, together accounting for 69.4% of the total breeding population in California (Zembal et al. 2008).

On Camp Pendleton, Dr. Richard Zembal (formerly of the USFWS) has conducted independent surveys of the light-footed clapper rail annually from 1980 through 2003. The survey areas include San Mateo Creek mouth, Las Pulgas Canyon mouth, Las Flores Marsh, French Creek, Cockleburr Canyon mouth, and Santa Margarita Lagoon (Note: not all locations were surveyed every year and two additional locations, Las Pulgas Canyon mouth and French Creek, were not surveyed after 1989; see Table F-8). During these survey efforts, clapper rails were detected only in the Santa Margarita River Lagoon (from 1982 to 1988, and not again until 2002), and Cockleburr Canyon mouth (only in 1982) (Zembal & Hoffman 2004). The individual recorded at Cockleburr Canyon and Las Flores Marsh was probably a transient bird (Zembal et al. 1984). In 1993 and 1997, unpaired rails were seen in the Santa Margarita Lagoon (Zembal & Hoffman 2000). One individual was observed in June 2007, and again in August in a pickleweed-dominated marsh between the

Salt Flats and the North Beach-South least tern colony. Another individual was seen in a freshwater marsh behind the North Beach-North least tern colony in June 2007 (Kershner pers. comm. 2007). During the 2008 basewide survey, which included all estuaries, marshes, and freshwater creeks of the Santa Margarita River watershed, one pair of rails was observed near the southern mouth of the Santa Margarita River (Kershner pers. comm. 2008). Total sightings on Base have never been greater than three pairs, for any single survey season, from 1983 to 2008. The 2008 survey detected a single pair and one individual male light-footed clapper rail within the Santa Margarita River Estuary (RECON 2009). The 2009 survey discovered the presence of chicks on Base first time on record; further results of the 2009 survey are still pending (Sullivan pers. comm. 2009).

TABLE F-8. NUMBER OF LIGHT-FOOTED CLAPPER RAIL PAIRS ON DIFFERENT DRAINAGES AT CAMP PENDLETON AND CALIFORNIA, 1980 – 2008

Year	Drainages on Camp Pendleton[a]							CA Statewide Totals
	SMC	LPC	LFC	FC	CCM	SMR	Total	
1980	-	-	-	-	-	0	0	203
1981	-	-	-	-	-	0	0	173
1982	0	0	0	-	1	2	3	221
1983	0	0	0	0	0	1	1	249
1984[d]	-	0	0	0	0	2	2	277
1985[d]	-	-	-	-	-	1	1	142
1986[d]	0	-	0	-	-	1	1	143
1987[d]	-	-	-	-	0	1	1	178
1988[d]	0	-	0	-	0	1	1	177
1989[d]	0	0	0	0	0	0	0	163
1990[d]	0	-	0	-	0	0	0	189
1991[d]	0	-	0	-	0	0	0	235
1992[d]	0	-	0	-	0	0	0	275
1993[d]	0	-	0	-	0	0#	0	300
1994[d]	0	-	0	-	0	0	0	288
1995[d]	0	-	0	-	0	0	0	262
1996[d]	0	-	0	-	0	0	0	325
1997[d]	-	-	-	-	0	0#	0	307
1998[d]	-	-	-	-	0	0	0	222
1999[d]	-	-	-	-	0	0	0	233
2000[d]	0	-	0	-	0	0	0	253
2001[d]	0	-	0	-	0	0	0	217
2002[d]	0	-	0	-	0	1	1	274
2003[d]	0	-	0	-	0	2	2	284
2004[d]	0	-	0	-	0	1	1	350
2005[d]	-	-	-	-	-	2	2	360
2006[d]	-	-	-	-	-	1	1	408
2007[d]	-	-	-	-	-	1	1	443
2008[e]	0	0	0	0	0	1#	1	?

[a] Location Abbreviations: San Mateo Creek (**SMC**); Las Pulgas Canyon Mouth (**LPC**); Las Flores (Creek) Marsh (**LFC**); French (Creek) Canyon Mouth (**FC**); Cockleburr Canyon Mouth (**CCM**); Santa Margarita (River) Lagoon (**SMR**).

[b] Indicates that no census was taken: "-".

[c] Indicates the detection of unpaired rails: "#".

[d] Source for Camp Pendleton clapper rail data: Zembel, Hoffman, Konecny, Gailband, Conrad and Mace 2008.

[e] Source for Camp Pendleton clapper rail data: RECON 2009.

F.10.3. Threats

The decline of the light-footed clapper rail is attributed to urban development, human disturbance, predation, and a general loss or degradation of feeding and nesting habitat in coastal salt marshes and estuaries (USFWS 1970b). Intensive dredging and filling activities within salt marshes along the California coastline from Santa Barbara to the Mexican border reduced salt marsh habitat from approximately 10,522 ha in the early 1970's to just 1,277 ha today. It is believed that most coastal salt marshes from Santa Barbara to the Mexican border once supported clapper rail populations (USFWS 2009j).

The destruction of suitable marsh habitat is no longer the primary threat to the light-footed clapper rail. Acquisition of land and conservation easements has resulted in the preservation of salt marsh habitat for the species. Of the total 29 marshes censused in 2007, 28 are located on public lands that are not subject to large-scale, land-use conversion. The remaining marsh at San Dieguito Lagoon in Del Mar is currently undergoing wetlands restoration by Southern California Edison. However, degradation or modification of light-footed clapper rail habitat is likely to remain a threat range-wide from dredging actions, changes to tidal influences or siltation, and contaminants from urban runoff. Active management is needed to maintain and create new habitat (USFWS 2009j).

Currently, nonpoint source pollution such as organochlorines is a primary cause for the loss of light-footed clapper rail habitat. Sources for this type of contamination in southern California have historically been sewage, industrial wastes, herbicides and pesticides. Marshes are also the recipients of unregulated "emerging" contaminants including polybrominated diphenyl ethers (PBDEs), and new generation pesticides such as pyrethroids. Absent any natural sources, releases of PBDEs are expected to be greatest in areas where their use is greatest, such as areas with dense residential and industrial development. Contaminants may reach light-footed rail habitat by tidal influences, surface and groundwater sources, or direct application of pesticides within marsh habitats. Within the marsh, contaminants may absorb or adhere to sediment and negatively impact light-footed clapper rail food sources (USFWS 2009j).

It has also recently become apparent that there is potential for threats to biota within clapper rail habitat from ongoing accelerated climate changes, which was not considered at the time of listing. A risk assessment to evaluate the relative vulnerability or resilience of these birds or their habitat to impacts associated with climate change has not yet been developed. However, this taxon is generally restricted in coastal salt marshes and prefers to nest in the lower marsh areas, much of which is immediately surrounded by urban landscapes with little room to expand if water levels were to rise (USFWS 2009j).

Additionally, since the majority of light-footed clapper rail populations are small, it is considered susceptible to inbreeding, loss of genetic variation, high variability in age and

sex ratios, demographic stochasticity, and random naturally occurring events such as wildfires, floods, droughts, or disease epidemics (USFWS 2009j).

Potential predators on eggs, nestlings, or adults include California ground squirrels (*Spermophilus beecheyi*), old world rats (*Rattus* spp.), striped skunk (*Mephitis mephitis*), feral house cats (*Felis catus*), dogs (*Canis familiaris*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), Virginia opossum (*Didelphis marsupialis*), and a variety of raptors (USFWS 2009j).

F.10.4. Recovery Strategy Goals

The prime objective of the light-footed clapper rail recovery plan is to increase the breeding population in California to at least 800 pairs by preserving, restoring, and/or creating approximately 4,047 ha of adequately protected, suitably managed wetland habitat consisting of at least 50% of marsh vegetation suitable for light-footed clapper rail in at least 20 marsh complexes (USFWS 1985b).

There are 36 individual areas identified in the recovery plan that are essential to light-footed clapper rail recovery, five of which are identified on Camp Pendleton: San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, Cockleburr Canyon marsh and the Santa Margarita River lagoon. The recovery plan identifies management actions for individual habitat areas that need to be initiated or improved to achieve recovery of the species. Management measures identified for the light-footed clapper rail at San Mateo Creek mouth, Las Pulgas Creek mouth, Las Flores Marsh, and Cockleburr Canyon marsh on Camp Pendleton are to assess the potential to support a population of rails or additional rails, prior to allocating funds to manage and restore these areas. Management measures identified for the light-footed clapper rail at the Santa Margarita River lagoon are: 1) improve/restore tidal action; 2) create/expand fringing freshwater marsh; 3) create nesting hummocks; 4) create additional salt marsh vegetation with an emphasis on low marsh; 5) enhance pickleweed (*Spartina*) vigor; 6) improve tidal channel network; 7) control human disturbance; 8) identify and control predators; and 9) develop and implement a program to control or reduce sedimentation.

As part of Camp Pendleton's light-footed clapper rail management through implementation of this INRMP and several other initiatives, two of the recovery tasks identified in the recovery plan are already implemented on Base. These tasks are: 1) controlled human access all year in the Santa Margarita Estuary (portions of Blue Beach) and at the mouth of Cockleburr Canyon into known breeding areas; and 2) identification and control of predators.

F.10.5. Management

The Base has implemented management practices for protecting the light-footed clapper rail and enhancing its breeding habitat. Programmatic instructions and habitat enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) guide the management of breeding habitat and foraging areas. These management measures have been implemented on Base since before the completion of the plan in 1995, and were incorporated in and have been managed through this INRMP since 2001. The Marine

Corps believes that these programmatic management actions provide a conservation benefit to the light-footed clapper rail.

Management practices, projects and programs include programmatic instructions that avoid and minimize impacts from training activity and other Base operations to the light-footed clapper rail and its habitat (e.g., vehicle and foot traffic must avoid all posted nesting areas, see below), exotic vegetation control, and annual predator control. Signs are posted at entrances (along access roads or beaches) to some wetlands, and the management zones, to deter unauthorized entry. Additionally, the Base grants access to statewide surveyors annually for clapper rail surveys.

Programmatic instructions are provided for users and residents of the Base to avoid and minimize adverse impacts to light-footed clapper rail habitat. Environmental regulations and restrictions that apply to the light-footed clapper rail and threatened and endangered species on Base are provided to all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species, and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*), and is depicted on both the Camp Pendleton Military Installation Map and the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to light-footed clapper rail habitat include: 1) military activities are kept to a minimum within the Santa Margarita Management Zone during the breeding/nesting season (1 March - 31 August); 2) all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) must stay at least 300 m away from posted nesting areas, and other activities (e.g., training foot traffic) must be kept at least 5 m from these areas; and 3) recreational activities are also kept to a minimum within the Santa Margarita Management Zone, and foot traffic within the management zone is prohibited within 50 m of posted nesting areas. Lifeguards at the Del Mar recreation beach are briefed on management prescriptions, and assist in keeping beach goers from entering the Santa Margarita Management Zone. Potential impacts to the clapper rail are addressed on a case-by-case basis through individual consultations with the USFWS (Sullivan pers. comm. 2009); see Appendix N (Section 2007 and Figure 2-1).

F.11. PACIFIC POCKET MOUSE (*PEROGNATHUS LONGIMEMBRIS PACIFICUS*)

FIGURE F-12. PACIFIC POCKET MOUSE
(PHOTO SOURCE: USFWS 2007M)

The Pacific pocket mouse (PPM) is a solitary nocturnal burrowing grainivore that is 10.9 to 15.2 cm long from nose to tip of the tail. Their coat is silky (spineless and bristle-free), and is predominately brown, pinkish-buff or ochraceous buff above and light brown, pale tawny, buff, or whitish below. Their ears are tipped with a patch of light hairs, the tail is distinctly or indistinctly bi-colored, and the soles of the hind feet are hairy (USFWS 1998a & 2010g).

The species can be found in hibernation ranging from September to April. Instead of utilizing a fat reserve for sustenance, during hibernation periods they display limited daily activity within their burrows feeding upon seed caches. Periods of dormancy have been found to not have a strictly daily or seasonal pattern, and they may be active during winter months outside of their burrows if seed production is high. The PPM will become torpid if deprived of food for 24 to 36 hours (year-round), and hibernate with a body temperature that fluctuates just above ambient air temperature. They typically emerge from hibernation in spring (usually March) once seed availability is prevalent again (USFWS 1998a & 2009a).

Breeding typically occurs from April through July (USFWS 1998a). Gestation typically lasts 23 days, and young are weaned after 30 days. Sexual maturity is reached within 41 days, and under favorable conditions breeding can occur within their natal year (USFWS 2010g). It is speculated that the PPM has a lifespan of 3 to 6 years (USFWS 1998a).

Although the PPM is a strong seed specialist, its diet may occasionally include insects and green vegetation. Seeds found within the cheek pouches of PPM have come from the following plants: *Heterotheca grandiflora* (telegraph weed), *Hordeum murinum* (barley), *Pluchea sericea* (arrow weed), *Crysothamnus* sp. (rabbitbrush), *Croton californicus* (Croton), *Centaurea melitensis* (tocalote), *Lotus prostratus*, *Monanthochloe* sp. (shoregrass), *Franseria* sp (ragweed, bur-sage), a rush, two species of salt bush, heliotrope, and mustard. An intensive field study of the dietary preferences of PPM based on fecal analysis found the diet of PPM included arthropods and seeds or green vegetation from *Eriogonum fasciculatum* (California buckwheat), *Lotus scoparius* (California broom), *Rhus integrifolia* (lemonadeberry), *Salvia* sp.(sage), *Erodium* sp. (storksbill), *Cryptantha clevelandii* and grasses. However, it has been found that the PPM shows a strong preference for grass and forb seeds with relatively less utilization of other foods. PPM were

also found to consume a higher proportion of forb seeds in the spring, and a higher proportion of grass seeds later in the year, which may relate to seasonal food availability (USFWS 2010g).

F.11.1. Status

The USFWS emergency listed the Pacific pocket mouse as endangered on 3 February 1994 (USFWS 1994b), and published the final listing on 29 September 1994 (USFWS 1994c). No critical habitat has been designated for this species; however, a recovery plan has been approved (USFWS 1998a). The recovery priority number for the PPM is 6C based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest. This number indicates that the taxon is a subspecies that faces a high degree of threat, and the recovery potential for PPM is considered low because current existing threats are difficult to alleviate and methods for intensive management of the taxon have not been well established. Recovery potential may be increased in the future with increased knowledge of captive propagation and translocations. The "C" indicates conflict with construction or other development projects, or other forms of economic activity (USFWS 2010g).

The CDFG listed the Pacific pocket mouse as a species of special concern, highest priority (CDFG 2009f).

F.11.2. Distribution and Occurrence

Coastal areas of Camp Pendleton historically supported populations of the Pacific pocket mouse. Early in the 20th century, before the establishment of Camp Pendleton, the species was found in the San Onofre area and at the Santa Margarita River Estuary (Montgomery 2005a). However, between 1936 and 1995, no observations of the Pacific pocket mouse were reported on Base (Patten et al. 1998 & USFWS 1994b). In addition, the species was only rarely captured after the 1930s in other portions of its geographic range, between Marina del Rey, Los Angeles County and in the vicinity of the Mexican border in San Diego County (Montgomery 2005a).

Populations of the federally endangered Pacific pocket mouse occur at three locations in the coastal region of Camp Pendleton. The three populations are named San Mateo North, San Mateo South, and Oscar One. The San Mateo North population is the smallest of the three and occurs at the extreme northwestern corner of the Base, along the immediate border between San Diego and Orange Counties. This population appears to have severely declined in recent years and the Base determined that a vegetation removal program was needed to improve habitat conditions for this species (Montgomery 2005a).

The San Mateo North population occurs immediately westward of Cristianitos Road and approximately 1/3 mile northward of Interstate 5. The dominant habitat type in this area is coastal sage scrub dominated by California sagebrush (*Artemisia californica*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), California buckwheat (*Eriogonum fasciculatum*), coyote bush (*Baccharis pilularis*) and lemonadeberry (*Rhus integrifolia*). Disturbed annual grassland also occurs in this area wherever shrubs are absent, in small inter-shrub spaces, and as a limited understory in the sage scrub community.

Several trapping studies between 1995 and 2000 confirmed that the Pacific pocket mouse was present in specific locations within the general San Mateo North Pacific pocket mouse area (Michael Brandman and Associates 1999; Michael Brandman and Associates and LSA Associates 1997 & Montgomery 2005a). Most captures of the species occurred in open microhabitats along well-used bicycle and pedestrian paths, amidst an overall dense sage scrub community. In particular, the area with the bulk of previous Pacific pocket mouse captures occurs near the base of the small hill's south-facing slope at this location.

A controlled burn was conducted in January 2001 in a portion of the San Mateo North Pacific pocket mouse population site that had recorded very low numbers of the species in previous trapping studies. The basic purpose of this burn was to improve conditions for the Pacific pocket mouse by reducing the density of sage scrub habitat in the area. It was hoped that the vegetation reduction program would encourage Pacific pocket mouse residing in the immediately adjacent primary (known) habitat area to colonize the burned area. Vegetation and ground surface conditions were measured immediately prior to the fire in 2000. Following the fire, vegetation, ground surface and rodent population information was collected during annual spring and summer monitoring surveys in 2001 to 2003. This report presents the results of the three-year monitoring effort to determine the effects of the burn on PPM, other rodents and vegetation (Montgomery 2005a).

The current prescribed burn study at San Mateo North concluded that the study area would more likely benefit the Pacific pocket mouse if the open character of the post-burn vegetation were perpetually maintained by fire (or other means) through time. However, any significant potential expansion of the extant the Pacific pocket mouse population, at the San Mateo North site, may be restricted by the limited size of the existing Pacific pocket mouse population.

In summary, Montgomery's study recommends the following management and monitoring approaches at the San Mateo Pacific pocket mouse population site:

- Fire may be required every second year for a limited amount of time to establish a self-sustaining, limited-shrub plant community. Thereafter, burns would likely be needed on a less frequent basis.
- The point intercept method is a fast and effective way to monitor vegetation changes and should be continued.
- Trapping sessions longer than the standard 5-nights protocol may be warranted at this location, and wherever populations are small and/or during years of apparently very low Pacific pocket mouse population levels.
- Future monitoring studies for the Pacific pocket mouse should be redesigned to include control sites in the study area for both trapping and vegetation aspects of the monitoring study. In addition, details of any monitoring study should be finalized in coordination with the Base Environmental Security office and personnel responsible for the prescribed burn. Pre-burn (pre-treatment) field studies should be included in any future habitat management studies at this or any other site (Montgomery 2005a).

F.11.3. Threats

Development is apparently the leading cause of habitat destruction and threat to the survival of the Pacific pocket mouse rangewide. Development (urban, suburban, and agricultural) in general can kill individuals by fragmenting and destroying pocket mouse habitat, as well as physically isolating populations, thereby restricting genetic diversity and making them susceptible to catastrophic events such as fire (USFWS 1998a).

Urban developments impact rodent populations by introducing and harboring domestic cats (increased predation rates), through proliferation of ant populations, obscuring lunar cycles and causing direct habitat avoidance with artificial night-time lighting (USFWS 1998a). However, the Pacific pocket mouse has been found to be capable of exploiting some human created habitats on Base (e.g., uncompacted road berms), and it can occur in areas without shrub cover, in areas that burn annually and that receive limited foot traffic (USFWS 1999g). Results from the USFWS 1996 survey indicate that the occurrence of the species is more closely associated with loose or friable soils that facilitate burrowing than it is with any specific vegetation classification or percent shrub cover (USFWS 1999g).

Increased fire frequency aseasonally has contributed to the loss, degradation, and fragmentation of coastal sage scrub vegetation range-wide in southern California. Incidental fires started by military training activities have potentially reduced available habitat for the Pacific pocket mouse on Base, however, existing habitat (Oscar One, San Mateo South, and San Mateo North colonies) has not been noticeably negatively impacted by fire since at least post ESA listing in 1994. Results from the USFWS 1996 survey indicate that fire may be a good management tool for the species because it facilitates reduction of non-native grasses in otherwise suitable habitat (USFWS 1999g).

Recreational activities, foot traffic and military training activities can impact Pacific pocket mouse habitat by compacting soils (USFWS 1999g).

F.11.4. Recovery Strategy Goals

The recovery strategy for the Pacific pocket mouse consists of two components. The first is to stabilize the existing populations by protecting currently occupied habitat, searching for additional populations and providing protection to any that are found. The second component is to establish additional populations through: 1) natural colonization/recolonization into nearby and adjacent habitats, coupled with habitat management in these areas; and 2) translocation and/or the release of captive-bred individuals into known suitable habitat (USFWS 1998a).

The recovery objectives of the Pacific pocket mouse involve a two-stage process, beginning with reclassification of the subspecies from endangered to threatened. The USFWS may consider reclassifying the Pacific pocket mouse to threatened when ten populations are independently viable and suitable or increasing, and their habitats are secure and fully protected through fee ownership by a resource agency or conservation program, conservation easement, or other means of permanent protection. Populations of the Pacific pocket mouse shall be considered viable if: 1) the appropriate analysis of measured population parameters indicates that each population has a 95% or greater chance

of surviving for 100 years; 2) occupied habitat consists of a minimum of 2,000 ha that are secure and fully protected through fee ownership by a resource agency or conservation program, conservation easement, or other means of permanent protections; 3) all Pacific pocket mouse populations are managed through a program to maintain genetic diversity for future generations; and 4) all Pacific pocket mouse populations and essential habitat are managed, so that current and potential threats are eliminated or minimized to the extent that each population is not at risk of extirpation. Essential habitat is defined as: habitat that is necessary for the full recovery of the subspecies.

Secondly, delisting will be considered if and when: 1) all actions necessary for reclassification to threatened have been implemented; 2) any necessary protection, restoration, and enhancement activities (on all sites that have been determined to be essential to the recovery of the subspecies) are successfully completed; and 3) populations of the Pacific pocket mouse are representative of the full (existing) genetic variability and historical geographical range of the subspecies and occur in habitats that collectively represent the full range of parameters observed and described in the past or during prescribed, future research, and monitoring events.

In order to delist, a determination that the following 5 factors no longer continue to adversely affect the survival and recovery of the Pacific pocket mouse must be found: 1) the present or threatened modification, or curtailment, of the Pacific pocket mouse habitat range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease and predation; 4) inadequacy of existing regulatory mechanisms; and 5) other human-made or natural factors affecting the continued existence of the subspecies (USFWS 1998a).

The Pacific pocket mouse recovery plan does not identify specific recovery criteria (or goals) on Camp Pendleton. However, Camp Pendleton continues to support improving habitat available for the Pacific pocket mouse.

F.11.5. Management

The U.S. Marine Corps is in consultation with USFWS regarding upland habitats basewide including occupied habitat for the Pacific pocket mouse. Until the Uplands BO is issued and a final management plan is implemented, the Pacific pocket mouse benefits directly or indirectly from current basewide management practices including exotic vegetation control, exotic animal/predator control (free roaming cats), use of native seed stock when conducting post-fire reseeding to enhance habitat, resource conservation awareness and education programs, and the terms and conditions of the consultation and BO for the construction, operation and maintenance of the Crucible Challenge Course in the Oscar One and Edson Range areas of the Base that was issued on 14 August 1996 (USFWS 1996b).

The BO for the Crucible Challenge Course required course elements to be located where the Pacific pocket mouse was determined to be absent or where current habitat conditions (extremely grassy or compacted areas) were likely to support few to no mice. All elements were constructed to ensure that movement of the species throughout the area is not restricted in any significant manner. Construction, operation and maintenance are restricted

to existing roads and personnel are to avoid parking vehicles on roadside berms in the vicinity of Pacific pocket mouse-occupied habitat. The Base implemented a monitoring and adaptive management program that assesses the net effect of the Crucible Challenge Course with the goal of long-term maintenance of the PPM population in the Oscar One and Edson Range areas (USFWS 1996b).

In cooperation with researchers from the San Diego Zoo, preliminary studies on Base are assessing the feasibility of translocation of the Pacific pocket mouse. The goal is to establish efficient and reliable methods for successful translocation to increase the number of viable populations. Current research is focusing on behavioral ecology and home range utilization through the use of trapping and radio-tracking (DOD PIF 2010a).

Management practices, environmental regulations and restrictions that avoid and minimize adverse impacts to the Pacific pocket mouse and other threatened and endangered species on Base are provided for users and residents of the Base by way of programmatic instructions. Programmatic instructions, natural resource, species and related environmental information for each training area and range are published in Base Order P3500.1N (*Range and Training Regulations*) and are depicted on the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to the Pacific pocket mouse include: 1) avoidance of digging (including constructing fighting positions); 2) limiting foot traffic and vehicle/equipment operations near known habitat to existing roads; and 3) keeping bivouac/command post/field support activities at least 300 m from Pacific pocket mouse habitat areas year-round. See Appendix N (Section 2007 and Figure 2-1).

Actions planned that support management of the Pacific pocket mouse include:

- Implement uplands species habitat conservation plan.
- In cooperation with the USFWS and California State Parks through a Preventing Extinction grant, the base is initiating a project to enhance PPM habitat at San Onofre State Beach. The project will involve reducing shrub cover from heavy cover to a patchy 20 to 30 percent, which is preferred by this specialist species. Pre- and post-treatment monitoring, non-native plant removal, and discouraging unauthorized foot and bike traffic will also contribute to the enhancement of the habitat for use by PPM (DOD PIF 2010a).
- A monitoring plan and a short- and long-term studies plan are currently being developed by Camp Pendleton in cooperation with the USGS Western Ecological Research Center and a scientific review panel. The plan is expected to be finalized in 2013 (Sosa pers. comm. 2010).

F.12. PEREGRINE FALCON (*FALCO PEREGRINUS ANATUM*)

FIGURE F-13. PEREGRINE FALCON
(PHOTO SOURCE: TOM KOGUT, USFWS)

The peregrine falcon has long pointed wings with a wing span of approximately 0.9 m, which form a sickle-shaped silhouette when extended in flight. The species typically weighs just over two pounds. Adults have a dark grey back, cheeks and crown, and dark bars or streaks on their pale chest and abdomen. Females and males are identical in appearance; however, the female can be a third larger. Immature peregrines are buff-colored in front and have dark-brown backs (USFWS 2009b). The peregrine falcon feeds primarily on other birds, such as songbirds, shorebirds and ducks, and in urban areas, starlings and pigeons. Unique to this species is the notched beak used to efficiently kill prey; they capture prey by flying high above and then stoop-diving, striking in mid-air, and killing with a swift sharp-blow typically by severing the spinal column at the neck (USFWS 2009b & CDFG 2008c). It is considered the fastest species in the world, and can reach speeds of over 200 mph (322 km/h) in a dive (Wikipedia 2009c).

F.12.1. Status

The peregrine falcon was federally listed as endangered on 2 June 1970. Then on 25 August 1999, the species was delisted and designated critical habitat was removed (USFWS 1999e); however, it still receives protection under the MBTA (CDFG 2008c).
The peregrine falcon was listed as California endangered on 27 June 1971 (CDFG 2005b), and then on 2 November 2007, the species was recommended by the State as a State candidate for delisting due to recovery of the species; on 4 November 09, the action to delist was finalized by the CDFG (CDFG 2008a & 2009o). It will remain a fully protected species in California pursuant to Fish and Game Code §3511 (b)(1) (CDFG 2008c).

F.12.2. Distribution and Occurrence

In North America, peregrine falcons can be found in mountains, valleys, and along the coastline, from the Arctic tundra down to Mexico. By the mid-1960's there were no peregrine falcons in the eastern United States. The decline spread westward and by the 1970s, western populations had declined by 90%. The peregrine falcon disappeared as a breeding species from southern California and in many other parts of the western United States, southern Canada, and the Northwest Territories. This drastic decline was caused by

the consumption of DDT, which lead to significant thining of eggshells and failed reproduction (USFWS 1999e). Beginning in 1974, various states, provinces and national agencies in both Canada and the United States put forth great efforts for the recovery of the peregrine falcon. Since 1977, over 2,700 peregrine falcons were released in the western United States (Tarski 2001). In 1998, the total known breeding population of peregrine falcons was 1,650 pairs in the United States and Canada (USFWS 1999e). Since their federal delisting in 1999, the U.S. population has grown from 1,750 pairs to 3,005 pairs in 2003 (USFWS 2006g).

Peregrine falcons can be seen on Camp Pendleton at any time of the year. In 2001, one peregrine falcon pair occupied a nesting site in the Ysidora Basin cliffs that overlooked the Santa Margarita River (Pete Bloom pers. comm. 2005). Occasionally, the peregrine falcon can be seen using the mouths of the Santa Margarita River, and the San Mateo and San Onofre Creeks to forage. Breeding season begins early March to late August. Individuals that breed in the north migrate into California for the winter.

F.12.3. Threats

The decline in the peregrine falcon population is attributed to environmental contaminants primarily DDT, polybrominated diphenyl ethers (PBDEs), polychlorinated biphenyls (PCBs) and various metal contaminants. Pesticide biomagnification caused organochlorine to build up in the species fat tissues, reducing the amount of calcium in their eggshells; with thinner shells, significantly fewer falcon eggs survived to hatching. Electrocution, human disturbance, and degradation of suitable nesting and foraging habitats also contributed to their range-wide population decline. Currently, their recovered population is considered secure and vital throughout the U.S. (USFWS 2006g & Wikipedia 2009c).

F.12.4. Management

The most effective benefit provided to the peregrine falcon is probably the fact that Camp Pendleton remains an open, continuous area for military training, and these natural areas can be used for breeding, foraging and nesting by the peregrine falcon and its prey. Management practices, projects and programs on Base that would provide benefit to the falcons are those that that would avoid and minimize disturbances or impacts from training activity and other Base operations on the habitats of their prey and/or cliff ledges that are used for nesting and roosting.

All ecosystem conservation programs on Base are designed to maintain and improve habitat conditions within ecosystems for all species that use those ecosystems. Wetlands and riparian areas in southern California are critical sources of water and habitats for many prey species of the peregrine falcon. Base management for these areas include: 1) controlling unauthorized entry to all wetlands and the management zones; 2) requiring vehicle movement and foot traffic in riparian and other wetland areas to remain on existing roads, trails, and established creek crossings; 3) ceasing tree-trimming activities during the breeding season; and 4) timing habitat-clearing activities to avoid breeding seasons to the maximum extent practicable to avoid damage to active bird nests. Additionally, the Base requires that planning professionals review proposed actions, with regard to conduct of actions proposed during the active breeding seasons (can be January through September) that could impact or cause loss of traditionally used nesting/roosting sites.

Due to the threat of electrocution, power companies are provided guidelines by the USFWS and/or the California Energy Commission on proper construction of electric wires and towers to mitigate electrocution related deaths, and are required to report any related mortalities; some instances are prosecuted and fined (CDFG 2008c).

Raptor studies/surveys were conducted on Base and completed in spring 2005; the final report still pending (Bloom pers. comm. 2005 & Sullivan pers. comm. 2012). When the report is finalized, the data will be incorporated into the INRMP.

F.13. RIVERSIDE FAIRY SHRIMP (*STREPTOCEPHALUS WOOTTONI*)

The Riverside fairy shrimp is a small freshwater crustacean in the Family Streptocephalidae of the Order Anostraca. The species was first collected in 1979 by C.H. Erickson and was identified as a new species in 1985 (USFWS 1998b). Mature males are 1.27 to 2.54 cm long. The frontal appendage is cylindrical, bibbed at the tip, and extends only part way to the distal end of the basal segment of the antenna. Mature females are about 1.27 to 2.21 cm in total length. Both males and females have a red color covering all of the ninth and 30-40% of the eighth abdominal segments (Answers.com 2010).

Riverside fairy shrimp are found in deep, cool-water-pools and occasionally in depressions (road ruts and ditches) that support suitable habitat. The species is restricted to dilute vernal pools, having relatively low sodium (Na^+) concentrations (below 60 millimoles per liter), low alkalinity (below 1,000 milligrams per liter), and neutral pH (near 7). A study by Gonzales et al. (1996), found that the species is unable to regulate internal ion levels and mortality increases at higher sodium concentrations and alkalinity (USFWS 2008h).

Large cyst banks of viable resting fairy shrimp eggs within the soils of vernal pools is well documented (USFWS 1998b). Once water has pooled after the commencement of the rainy season, shrimp begin to hatch from encysted embryos. Upon sufficient hydration of eggs, hatching time is usually between 7 to 12 days (USFWS 2008h). Hatching responses correspond well with what is known of the germination of vernal pool plant species (Bauder 1992 & USFWS 1998b). Shrimp eggs tend to hatch or germinate at cool temperatures, with species-specific differences in responses that are related to temperature regime. Lack of hatching at higher temperatures (greater than 25 °C) protects the species from the infrequent summer storms that might otherwise be sufficient to stimulate development, but inadequate for the organism to complete its life cycle. Only a portion of the dormant egg bank, often less than 10%, hatches with any one hydration (USFWS 1998b). Subsequent hydrations may result in a cumulative total of only 30 to 40% hatching. Due to the small size of the species, this low hatching percentage makes detection of the species potentially difficult, especially if the vernal pool has not been inundated long enough for full maturation to occur (USFWS 2008h). Maturation to reproductive age from hatching is approximately 7 weeks to 2.5 months for the Riverside fairy shrimp; the maturation period is compressed or expanded, depending on ambient water temperatures (USFWS 2002e & USFWS 2008h). The young shrimp swim upside down in the pools as they filter feed on algae and zooplankton with their 11 pairs of leaf-like legs. The shrimp are translucent, and as they mature to reproductive age, the females develop prominent ovisacs while the males' second antennae become modified for clasping the females during

mating. Fairy shrimp play an important role in the community ecology of many ephemeral water bodies; they are fed upon by waterfowl (Krapu 1974 & USFWS 1998b) and other vertebrates, such as western spadefoot toad tadpoles *(Scaphiopus hammondi*) (USFWS 1998b).

F.13.1. Status

The USFWS listed the Riverside fairy shrimp as federally endangered on 3 August 1993 (USFWS 1993c). Final critical habitat was published for the Riverside fairy shrimp on 30 May 2001. On 30 October 2002, the DC Circuit Court vacated the published critical habitat. Critical habitat was proposed again on 27 April 2004, and on 19 October 2004, the comment period was reopened until 18 November 2004, and the draft economic analysis was made available. Final critical habitat was designated on 12 April 2005 (USFWS 2005g). Final critical habitat on Camp Pendleton within Sub-units 4a and 4b was exempted under Section 4(a)(3) of the ESA based on conclusion that the Base's INRMP provided a benefit to the Riverside fairy shrimp. Base areas near Christianitos Creek (Sub-unit 2H) consisting of approximately 19 ha of essential habitat on lands leased to the California Department of Parks and Recreation were excluded under Section 4(b)(2) on national security grounds, so they could be available quickly to the Marines in the event they were needed for military training. Thus, no lands owned or controlled by Camp Pendleton have been designated as critical habitat in the final rule (USFWS 2005g). A recovery plan has been approved for the listed species of southern California vernal pools, which includes the Riverside fairy shrimp (USFWS 1998b). The recovery priority number for Riverside fairy shrimp is 5C according to the USFWS's 2007 Recovery Data Call for the Carlsbad Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest. The ranking number indicates that the taxon faces a high degree of threat and has a low potential for recovery. The "C" indicates conflict with construction or other development projects (USFWS 2008h).

F.13.2. Distribution and Occurrence

The northern range of the Riverside fairy shrimp is defined by Skunk Hollow and the Santa Rosa Plateau in Riverside County and coastal sites in San Diego and Orange Counties. It is documented from one complex on MCAS Miramar, throughout MCB Camp Pendleton, and eight complexes on Otay Mesa. In Baja California, Mexico, it has been found in Valle de Las Palmas and at Baja Mar north of Ensenada (USFWS 1998b).

Initial reconnaissance surveys for Riverside fairy shrimp were conducted in 1993; they began at the bluffs and small mesa southwest of the I-5 southbound rest stop (White Beach) and radiated outward from there. Much of the area contained Mima mound topography. The greatest number of pools occupied by Riverside fairy shrimp were found near the White Beach rest stop on both sides of I-5. A survey conducted by RECON during the 1997/98 wet season identified the coastal mesas on Camp Pendleton as supporting one of the largest known populations of this species, with at least 81 pools occupied by fairy shrimp (73 with Riverside fairy shrimp and 8 with both Riverside and San Diego fairy shrimp) (RECON 2001a). At the time, these 81 pools represented about 60% (81 of 135) of all known Riverside fairy shrimp occupied pools range-wide (Moeur 1998). Basewide isolated ephemeral wetlands mapping and fairy shrimp surveys began in spring 2005. It

was determined that a total of 111 pools (56% of all known occupied pools range-wide) have Riverside fairy shrimp present on Base (USFWS 2008h & Mabb pers. comm. 2009).

F.13.3. Threats

The Riverside fairy shrimp has the most limited range of any endemic California fairy shrimp, and is currently threatened by habitat loss and degradation due to: military, urban and agricultural development, off-road vehicle use, trash dumping, trampling, military maneuvers, competition and predation by non-native species, drainage or watershed alterations, and drought (USFWS 2002e & USFWS 2008h). Fragmentation and destruction of isolated vernal pool groups can have subtle, but significant adverse effects. Zedler (1987) found that species diversity within vernal pools and genetic diversity within a single species are evenly distributed throughout a given group of pools and between groups of pools. Thus, preservation of fewer pools may reduce the overall genetic-diversity of the species, conceivably affecting its long-term survivability.

F.13.4. Recovery Strategy Goals

The recovery strategy for the Riverside fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp (*Branchinecta sandiegonensis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), San Diego mesa mint (*Pogogyne nudiuscula*), Otay mesa mint (*Pogogyne abramsii*) and California Orcutt grass (*Orcuttia californica*), so that these species may be reclassified from endangered to threatened status (USFWS 1998b).

Before reclassification of Riverside fairy shrimp from endangered to threatened can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton vernal pool complexes and associated species have been identified as necessary to stabilize the Riverside fairy shrimp and several other listed vernal pool species. The vernal pool complexes that are identified as necessary to stabilize these listed species are: Cockleburr Mesa, San Mateo, Las Pulgas, Stuart Mesa, State Park Lease Area and Wire Mountain. Once the species is stabilized, reclassification of Riverside fairy shrimp to threatened status may be considered when the following criteria are met: 1) existing vernal pools and their associated watersheds are secured; 2) where necessary reestablish vernal pool habitat to the historical structure; and 3) manage and monitor habitat and listed species (USFWS 1998b & USFWS 2008h).

Additionally, implementation of recommendations 1-4 over the next 5 years are needed to provide information that would allow the USFWS to consider potentially downlisting the species:

1. Support continued conservation, enhancement, management, and monitoring of vernal pool habitat, including monitoring of restored/enhanced habitat to determine if vernal pool restoration projects continue to be viable through time (e.g., artificial clay layer remains stable and supports adequate ponding).

2. Support completion and peer review of Marine Corps' study evaluating the impact of tracked vehicle training on fairy shrimp, and develop conservation measures based on the results.

3. Conduct a study of the genetic distribution of Riverside fairy shrimp analogous to the San Diego fairy shrimp study.

4. Determine the extent of all remaining occupied habitat, including status (e.g., conserved, restored, managed, monitored, impacted, illegally impacted) and needs (e.g., conservation, restoration, management, monitoring) categories for all Riverside fairy shrimp habitat complexes.

5. Develop protocols for quantitative estimates of adult and cyst abundance, as feasible, and define ranges within which – 1) cyst banks would be considered adequately populated; and 2) adult numbers (given sufficient pooling) reflect a healthy population. The Riverside fairy shrimp survey protocol should be updated to include acquisition of this abundance data. The defined abundance ranges should be used to model population viability analysis (PVA) for Riverside fairy shrimp, and as standards for determining Riverside fairy shrimp habitat restoration success.

6. Consider revising the 1998 Recovery Plan to incorporate new information and address issues discussed in "Recovery Criteria" section of the 2008 Riverside Fairy Shrimp (*Streptocephalus woottoni*) 5-Year Review: Summary and Evaluation. Recovery criteria should include PVA information available for the Riverside fairy shrimp to help determine which areas should be preserved and to guide translocation efforts. Recovery criteria should include quantifiable thresholds for downlisting and delisting (USFWS 2008h).

F.13.5. Management

The U.S. Marine Corps is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide including occupied Riverside fairy shrimp habitat. Current basewide management practices that directly or indirectly benefit Riverside fairy shrimp include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing) and avoidance and minimization of impacts from projects and Base activities including training. Controls on training activities include: 1) keeping bivouac/command post/field support activities at least 300 m from Riverside fairy shrimp habitat areas year-round; 2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and 3) prohibiting digging (including construction of fighting positions) in Riverside fairy shrimp habitat.

Environmental regulations and restrictions that apply to the Riverside fairy shrimp and its habitat on Base are provided for all users of ranges and training areas to guide training activities in a manner which protects these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*), and is depicted on the most current

Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2007 and Figure 2-1).

Planned actions that support management of the Riverside fairy shrimp include:

- Implement uplands BO (currently in consultation with the USFWS).
- Implement uplands species habitat conservation plan (currently in consultation with the USFWS).

F.14. SAN DIEGO BUTTON-CELERY (*ERYNGIUM ARISTULATUM VAR. PARISHII*)

San Diego button-celery is a perennial herb endemic to vernal pool habitats that has a persistent taproot, and is a member of the Carrot family (Apiaceae). The plant has a spreading to erect habit, reaching a height of 40.6 cm or more. The stems and toothed leaves are gray-green with spinose lobes, giving it a prickly appearance. Inflorescences develop form April to June on short peduncles (stalks) with few to many greenish flower-heads varying in length from 1.7 to 2.8 mm (USFWS 1998b & ZipcodeZoo 2009).

F.14.1. Status

San Diego button-celery was listed as State endangered in July 1979 (CDFG 2005), and federally endangered on 3 August 1993 (USFWS 1993c). Critical habitat has not been proposed for this species, but it is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998b). It is also included in the Multiple Species Conservation Program (MSCP) of southern San Diego County, the San Diego Gas and Electric Company Subregional Natural Communities Conservation Planning (NCCP), and the Western Riverside MSHCP pursuant the California NCCP Act of 1992 (CDFG 2009n).

F.14.2. Distribution and Occurrence

San Diego button-celery ranges from as far north as the Santa Rosa Plateau, Riverside County, south to the mesas north of Ensenada, Mesa de Colonet, and San Quintin, Mexico (Baja California). It is found in vernal pools on Del Mar Mesa, Mira Mesa, Kearny Mesa, MCAS Miramar, Camp Pendleton, and at sites within the cities of Tierrasanta, San Marcos, Carlsbad, and Ramona; it was extirpated from a site in the City of La Jolla. The species is also found in the southern portion of San Diego County on Otay Mesa, near the Lower Otay Reservoir and in Proctor Valley. It also was found near the Tijuana Airport, but is believed to be extirpated at this locale. There are no known herbarium collections of the species from the San Diego Mesa (e.g., Normal Heights and San Diego State University). Seventy percent of the total point localities occur within the preserve planning area of the MSCP (USFWS 1998b). In 1979, San Diego button-celery was known from 65 pool groups; by 1986, this species remained in 61 pool groups (USFWS 1993c).

On Camp Pendleton, San Diego button-celery has been found in a total of 72 GIS mapped locations south of the Santa Margarita River basin, inland near the Wire Mountain housing development (Figure 3-37). The known locations of San Diego button-celery on Base are a compilation of multiple survey efforts (some basewide, others site-specific) over many

years. The earliest known survey that identified the species on Base was conducted by Pacific Southwest Biological Services, Inc. in 1986 (PSBS 1986). Dudek & Associates, Inc. conducted a basewide rare plant survey from 1993 to 1996, and was the first to map San Diego button-celery locations on Base using GPS technology (Dudek & Associates 1996). During their basewide surveys in 1997, an additional 44 pools containing San Diego button-celery (included in the total of 72 above) were identified (RECON 2001b).

F.14.3. Threats

San Diego button-celery, as with other vernal pool specific species, is threatened by the loss of habitat. In general, vernal pool habitat in San Diego County has declined 97% (from 23,859 ha to 838 ha) since the early 1900s (Oberbauer 1996). Most of the remaining vernal pools, particularly in San Diego County, face the following increasing threats identified by the USFWS: urban development, agricultural and roadway development, off-road vehicular activity, trampling by people and livestock, military activities, and watershed (drainage) alteration.

F.14.4. Recovery Strategy Goals

The recovery strategy for the San Diego button-celery is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint and California Orcutt grass, so that these species may be reclassified from endangered to threatened status (USFWS 1998b).

According to recent surveys, not all of the vernal pool complexes identified on Camp Pendleton in the September 1998 - Vernals Pools of Southern California Recovery Plan as necessary to stabilize the species are still considered to have the species present (USFWS 1998b). All known occurrences of San Diego button-celery on Base are now deemed to be south of the Santa Margarita River, and therefore recovery goals as stated in the recovery plan are no longer achievable, and are anticipated to be revised by the USFWS in consultation with the U.S. Marine Corps in the future.

F.14.5. Management

The Base is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide including occupied San Diego button-celery habitat. Current basewide management practices that directly or indirectly benefit San Diego button-celery include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing) and avoidance and minimization of impacts from projects and Base activities including training. Controls on training activities include: 1) keeping bivouac/command post/field support activities at least 300 m from San Diego button-celery habitat year-round; 2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and 3) prohibiting digging (including construction of fighting positions) in San Diego button-celery habitat.

Environmental regulations and restrictions that apply to the San Diego button-celery, its habitat and other threatened and endangered species on Base are provided for all users of

ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually); see Appendix N (Sections 2001, 2007, and Figure 2-1).

Planned actions that support management of San Diego button-celery include:

- Implement uplands BO and uplands species habitat conservation plan (currently in consultation with the USFWS)

F.15. SAN DIEGO FAIRY SHRIMP (*BRANCHINECTA SANDIEGONENSIS*)

The San Diego fairy shrimp is a small freshwater crustacean in the family Branchinectidae of the Order Anostraca. It is small and delicate with large stalked compound eyes, no carapace, and 11 pairs of swimming legs. Mature males attain 1.5- and females 1.3-cm in length. These tiny crustaceans can be distinguished from other fairy shrimp of the same genus by the shape of the second antenna (males), or the shape and length of the brood sac and the presence of paired dorsolateral spines on five of the abdominal segments (females) (USFWS 1997c). Fairy shrimp are presumed to feed on algae, bacteria, protozoa, rotifers, and detritus (Pennak 1989; Eng et al. 1990 & USFWS 2003c). The San Diego fairy shrimp is a habitat specialist found in smaller, shallow vernal pools and ephemeral (temporary) basins that range in depth from approximately 2 to 12 inches, and in water ranging from 50 to 68 ˚F (USFWS 1997c). However, the species occasionally occurs in ditches and road ruts that can support suitable conditions. No individuals have been found in riverine waters, marine waters, or other permanent bodies of water (USFWS 1998b). Adult San Diego fairy shrimp are usually observed from January to March; however, in years with early or late rainfall, the hatching period may be extended. The species hatches and matures within 7 to 14 days, depending on water temperature (Hathaway and Simovich 1996 & USFWS 1997c). San Diego fairy shrimp may no longer be visible after about a month due to completion of their lifecycle and/or predation, but they will continue to hatch if subsequent rains result in additional water or refilling of the vernal pools (USFWS 1997c). The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The “resting eggs” or “cysts” are capable of withstanding temperature extremes and prolonged drying. When the pools refill in the same or subsequent rainy seasons, some but not all of the eggs may hatch. Fairy shrimp egg-banks in the soil may be composed from several years of breeding (Donald 1983 & USFWS 1997c).

F.15.1. Status

The San Diego fairy shrimp was listed as federally endangered on 3 February 1997 (USFWS 1997c). Critical habitat (1,629 ha) for the San Diego fairy shrimp was designated on 23 October 2000. On 11 June 2002, the U.S. District Court for the Central District of California granted the Service’s request for a remand of the San Diego fairy shrimp critical habitat designation. The USFWS reproposed, critical habitat for this species on 22 April 2003 (USWFS 2003c), consisting of approximately 2,468 ha within Orange and San Diego counties; vernal pools on Camp Pendleton that occur within mission-essential training areas were excluded from proposed critical habitat under Section 4(b)(2) of the ESA, but

are considered essential for the recovery of the San Diego fairy shrimp. Within Recovery Unit 2 (San Diego: North Coastal Mesa) vernal pools in non-training areas of Camp Pendleton were proposed as critical habitat. The areas proposed on Camp Pendleton included: 1) lands leased by the Marine Corps to the California Department of Parks and Recreation and private interests; 2) Cockleburr preserve; and 3) non-training lands around the Wire Mountain housing area. These pools represent some of the best examples of coastal pools still remaining in San Diego County (USWFS 2003c). On 12 December 2007, the USFWS designated all MCB Camp Pendleton lands exempt from San Diego fairy shrimp critical habitat, citing this INRMP's provisions as providing a sufficient benefit to the species (USFWS 2007e).

The San Diego fairy shrimp is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998b).

F.15.2. Distribution and Occurrence

San Diego fairy shrimp are restricted to vernal pools in coastal southern California south to extreme northwestern Baja California, with San Diego County supporting the largest number of remaining occupied vernal pools (USFWS 2000d). The USFWS estimated at the time of listing that fewer than 81 ha of occupied vernal pool habitat remained in San Diego County, of which approximately 70% is thought to occur on Department of Defense lands (USFWS 2000d & 2003c). The San Diego fairy shrimp is found in San Diego County from Camp Pendleton, inland to Ramona, and south through Del Mar Mesa, Kearney Mesa, Proctor Valley, and Otay Mesa, and into northwestern Baja California, Mexico. In Baja California, it has been recorded at two localities, Valle de las Palmas south of Tecate and Baja Mar, north of Ensenada. Small populations occur in Orange County, and a single isolated female was reported from a vernal pool in Isla Vista, Santa Barbara County, California (USFWS 1998b).

On Camp Pendleton, the San Diego fairy shrimp shares the same coastal strip distribution as the Riverside fairy shrimp. However, within this limited range, especially in the southwestern part of the Base, the San Diego fairy shrimp occurs more often than either Lindahl's fairy shrimp (*Branchinecta lindahli)* or Riverside fairy shrimp. On Base, the San Diego fairy shrimp appears to be locally abundant in natural vernal pools and in man-made pools that have not been disturbed in several seasons (Moeur 1998). Generally speaking, vernal pools of high natural-quality will be occupied by San Diego fairy shrimp while more degraded pools have a greater likelihood of containing Lindahl's fairy shrimp. San Diego fairy shrimp occur primarily in the Victor, Oscar One, and Oscar Two training areas, as well as the Wire Mountain housing area (Figure 3-34). Basewide survey efforts conducted since spring 2005 indicated that over 279 pools were occupied by San Diego fairy shrimp (USFWS 2008i & Mabb pers. comm. 2009). Survey and mapping data will be incorporated into the INRMP upon completion of these efforts.

F.15.3. Threats

Regionally, the San Diego fairy shrimp is threatened by habitat destruction from urban and water development, flood control, highway and utility projects, as well as conversion of wildlands to agricultural use. Changes in hydrologic pattern, overgrazing, military training, and off-road vehicle activity also imperil this species.

F.15.4. Recovery Strategy Goals

The recovery strategy for the San Diego fairy shrimp is to conserve and enhance southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside and San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint, Otay mesa mint and California Orcutt grass so that these species may be reclassified from endangered to threatened status (USFWS 1998b).

The Vernal Pools of Southern California Recovery Plan identifies eight distinct Management Areas in southern California, and Camp Pendleton is located in the San Diego - North Coastal Management Area. Before reclassification of San Diego fairy shrimp from endangered to threatened can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton vernal pool complexes and associated species have been identified as necessary to stabilize listed vernal pool species. The vernal pool complexes that are identified as necessary to stabilize the San Diego fairy shrimp are: Cockleburr, San Mateo, Las Pulgas, Stuart Mesa and Wire Mountain. Once the species is stabilized, reclassification of San Diego fairy shrimp to threatened status may be considered when the following criteria are met: 1) existing vernal pools and their associated watersheds are secured; 2) where necessary reestablish vernal pool habitat to the historical structure; and 3) manage and monitor habitat and listed species. Vernal pool complexes identified by the USFWS as necessary to reclassify the listed species to threatened that occur on Camp Pendleton are identified as Basilone and O'Neill (indicated locations mapped are pending from the USFWS) (USFWS 1998b).

F.15.5. Management

The Base is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide including occupied San Diego fairy shrimp habitat. Current basewide management practices that directly or indirectly benefit San Diego fairy shrimp include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, fairy shrimp dispersal/translocation, and impact of signing and/or fencing) and avoidance and minimization of impacts from projects and Base activities including training. Controls on training activities include: 1) keeping bivouac/command post/field support activities at least 50 m from San Diego fairy shrimp habitat year-round; 2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and 3) prohibiting digging (including construction of fighting positions) in San Diego fairy shrimp habitat.

Environmental regulations and restrictions that apply to the San Diego fairy shrimp, its habitat and threatened and endangered species on Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2007 and Figure 2-1).

Planned actions that support the San Diego fairy shrimp include:

- Implement uplands BO and uplands species habitat conservation plan (currently in consultation with the USFWS).

F.16. SOUTHERN CALIFORNIA STEELHEAD TROUT (*ONCORHYNCHUS MYKISS*)

Oncorhynchus mykiss exhibits one of the most complex suites of life history traits of any salmonid species. Individuals may exhibit anadromy (meaning they migrate as juveniles from freshwater to the ocean, and then return to spawn in freshwater), or freshwater residency (meaning they reside their entire life in freshwater). Resident forms are usually referred to as "rainbow" or "redband" trout, while andronomous life forms are termed "steelhead". Few detailed studies have been conducted regarding the relationship between resident and andronomous *O. mykiss* and as a result, the relationship between these two life forms is poorly understood. Currently, studies are being performed to determine if the andronomous form is a standard or environmentally triggered (displaying phenotypic plasticity) portion of the species population, or if it is genetically distinct (NMFS 2009b). One obvious advantage to the andronomous form is increased fecundity (~3.5% more eggs) attributed to the lager size females obtain in marine compared to freshwater habitats; however, the increased mortality rate of andronomous (~10% greater in marine waters) compared to resident *O. mykiss* may negate this advantage, depending upon ecologlical conditions (NMFS 2009b).

Steelhead typically migrate to marine waters after spending 2 years (range 1 to 3 years) in freshwater. Then, they reside in marine waters typically for 2 or 3 years, prior to returning to their natal stream to spawn as 4- or 5-year-olds. Unlike other Pacific salmon, steelhead are iteroparous (capable of spawning more than once before they die). However, it is rare for steelhead to spawn more than twice before dying at a maximum age of about 11 years; most that do so are females. Winter-run steelhead typically spawn between November and April, and summer-run steelhead typically spawn between May and October (NMFS 2009). Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months in "redds" (nesting gravels) before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, young juveniles or ''fry'' emerge from the gravel and begin actively feeding. Juveniles rear in freshwater from 1 to 3 years, and then migrate to the ocean as "smolts" (NMFS 1997 & NMFS 2009).

F.16.1. Status

The Southern California Evolutionarily Significant Unit (ESU) of *O. mykiss* was federally listed as an endangered species by the National Marine Fisheries Service (NMFS) on 18 August 1997 (NMFS 1997), and by the USFWS on 17 June 1998 (USFWS 1998d). This ESU included streams from the Santa Maria River in San Luis Obispo County (inclusive) to and including Malibu Creek in Los Angeles County. On 19 December 2000, the NMFS issued a proposed rule to extend the current range of listed Southern California Steelhead to include the population of steelhead found in San Mateo Creek located in northern San Diego County (NMFS 2000b). To assist in the determination of a ruling, the CDFG prepared a report for NMFS on the steelhead in San Mateo Creek, and the public comment period was extended to allow sufficient review (NOAA 2000). On 1 May 2002, the NMFS

issued a final rule to extend the southern most range of the Southern California Steelhead trout from its current southern boundary of Malibu Creek to the U.S./Mexico border (NMFS 2002b). Critical habitat was designated for the original Southern California *O. mykiss* ESU on 16 February 2000 (NMFS 2000a). As the result of a court-approved consent decree, the NMFS issued a final rule effective 30 April 2002, that removed critical habitat designations for 19 salmon and steelhead ESUs including the Southern California Steelhead (NMFS 2003). On 2 September 2005, the NMFS published a final rule designation of critical habitat for the steelhead in California (NMFS 2005). Critical habitat was not designated on Camp Pendleton because Base lands are subject to a qualifying INRMP prepared under Section 101 of the Sikes Act 16 U.S.C. 670a (NMFS 2005).

On 5 January 2006, the NMFS concluded that the Southern California Steelhead - Distinct Population Segment (DPS) is in danger of extinction throughout all or a significant portion of its range, and listed the Southern California Steelhead DPS as an endangered species. The Southern California Steelhead DPS includes all naturally spawned populations of steelhead below natural and manmade impassable barriers in streams from the Santa Maria River, San Luis Obispo County, California (inclusive) to the U.S. - Mexico Border. This DPS does not include any artificially propagated steelhead stocks that reside within the historical geographic range of the DPS (NMFS 2006). Potential on Base populations are currently identified as part of the Santa Catalina Gulf Coast – Biogeographic Population Group by the NMFS (NMFS 2009b).

The NMFS final recovery plan is intended to serve as a guide for those interested in restoring steelhead runs within Southern California. It is not a regulatory document, but a blueprint which describes the unique biological characteristics of Southern California steelhead. It identifies the threats which have brought Southern California Steelhead to the brink of extinction, and the types of restoration actions which could allow steelhead runs to increase to a level that may allow their removal from the list of endangered species. It also sets out a general strategy for recovering individual watersheds with specific goals, and provides an estimate of the time and cost of recovery actions that can be used in planning, applying for grants and securing funding. As required by the act, the recovery plan identifies measures to restore the natural habitats which have supported steelhead. The plan does not call for restoring the ecosystem to the conditions present before human impacts. It does propose some logical habitat improvements that would develop better conditions for steelhead and other species. High-priority recovery actions include the removal of in-stream barriers that impede the passage of fish, the provision of appropriate seasonal flows of water, the control of point and nonpoint waste discharges, the removal of non-native species, the restoration of vegetation in riparian areas, the management of wildfires, the control of erosion, and the restoration of coastal estuaries. As a result of these diverse recovery actions, the Southern California Steelhead Recovery Plan also contributes to the protection and restoration of a wide variety of other native species in addition to steelhead (NCTimes 2010 & NMFS 2012a).

A steelhead restoration and management plan for California is available from the CDFG (McEwan and Jackson 1996).

F.16.2. Distribution and Occurrence

Historically, steelhead were distributed throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja California peninsula (NMFS 1999). Locally, steelhead were reported making runs in the San Mateo, San Onofre and San Juan Creeks, and in the San Luis Rey and Tijuana Rivers of Orange and San Diego Counties by Hubbs in 1946 (McEwan and Jackson 1996). Presently, the native species distribution extends from the Kamchatka Peninsula, east and south along the Pacific coast of North America, to at least the Santa Margarita River on Camp Pendleton (NMFS 1999 & Rouse pers. comm. 2010). The species has also been introduced for food or sport in at least 45 countries, and on every continent except Antarctica (Wikipedia 2009d). The Southern California Steelhead DPS encompasses any existing or potential native *O. mykiss* populations in watersheds from the Santa Maria River (just north of Point Conception) south to the Tijuana River at the U.S. Mexico border (NMFS 2009b).

A long drought extending from 1948 to 1979, which resulted in intolerable water temperatures and insufficient waterflows to allow migration basewide, is attributed to the virtual extirpation of steelhead on Base (USFWS 1998g). Also potentially attributing to the species extirpation on Base during the 1950s was: 1) increased water extraction which resulted in lower waterlevels and less habitat, increased inriver fishing pressure, and disease transfer; 2) predation following introduction of hatchery trout and predatory game fish; and 3) increased siltation resulting from fire and agricultural activities (USFWS 1998g).

The three drainages on Base with potential for steelhead presence are San Mateo Creek, San Onofre Creek and the Santa Margarita River. The historical presence of *Oncorhynchus mykiss* within these drainages is noted below:

San Mateo Creek – Data indicates that steelhead do not use San Mateo Creek within Base boundaries for spawing or as over-summering rearing habitat, and it acts only as a migration corridor when sufficiently saturated; however, the upper portion is utilized within the Cleveland Nation Forest. The intermittent presence of *Oncorhynchus mykiss* on Base within San Mateo Creek is noted until the mid to late 1940's after which their presence is attributed to hatchery trout plants on- and off-Base (average of 1,080 individuals stocked on Base annually from 1945 to 1985; range 500 to 2,700 per year). The few sightings post 1980 are likely a result of *Oncorhynchus mykiss* straying from other drainages. Whether planted rainbow trout survived and became steelhead can only be speculated upon; since hatchery rainbow stocks came from various mixtures of coastal steelhead their ability to spawn with native trout is likely, and has been reportedly observed by the CDFG (USFWS 1998g). In 1997, the first reoccurrence of steelhead was observed on Base in San Mateo Creek since 1993 (2 adults) and 1989 (some 38 cm trout) (NOAA 2000 & USFWS 1998g). Information compiled by CDFG is limited, but suggests that native adult steelhead that strayed from another watershed, entered San Mateo Creek and successfully spawned in 1997 (NOAA 2000). The juvenile progeny of those spawning adults were observed by CDFG during their field investigations in the spring and summer of 1999; between 3 March and 3 September 1999, 78 juvenile steelhead observations were made, and genetic testing by the CDFG determined that the steelhead observed were native to the region (Southern California ESU) and offspring of an andronomous form (NOAA

2000). In 2000, the numbers of steelhead observed declined from 3 adults and 17 juveniles observed in June to only 1 juvenile seen in November (Hovey 2000a-f). In cooperation with NMFS and CDFG, existing pools were monitored beginning in summer 2001 and throughout 2002 to determine if *O. mykiss* were able to survive in San Mateo Creek (MCBCP 2003b). The most recent confirmed observation of steelhead in San Mateo Creek is of one individual in December 2003. Extensive surveys conducted in June 2005 indicated no steelhead were present in existing pools on Base (Rouse pers. comm. 2009); however, as noted above the portion of the San Mateo Creek within Base boundaries serves only as a migration corridor (December – March) to suitable off Base habitat, so the continued presence of *O. mykiss* on Base was not expected (Figure 3-27 illustrates the general locations of steelhead observances in San Mateo Creek).

San Onofre Creek – The best *O. mykiss* habitat (especially as nursery habitat) remaining on Base is considered to be within the upper part of San Onofre Creek, all other drainages on Base serve only as upsteam and downstream migration corridors. Native *O. mykiss* were noted as being present throughout the lower 1.6 km of the creek, including the lagoon, until the 1940's. Steelhead were observed making consistent runs up the creek until the early 1950's, and continued observations were reportedly made by the CDFG until the early 1960's. The last noted presence of juvenile *O. mykiss* within the creek was on 15 June 1950, and their presence was recorded as abundant (USFWS 1998g).

Santa Margarita River – *O. mykiss* were first planted into the river in 1941 and 1942 from Arrowhead Lake Hatchery and Fillmore Hatchery respectively. For an approximately 20 year period (1961 – 1984), an average of 11,600 fish were planted annually by the CDFG; stocking of the river ceased in 1984. The last native *O. mykiss* was reportedly caught in the Santa Margarita River in 1967, and only the intermittent presence of stocked trout are noted from 1983 to 1987. Limited anecdotal information suggest that steelhead have been intermittently observed within the river in 1986, 1991, and 1996 (NOAA 2000). The most recent confirmed observation of steelhead on Base was of a few individuals in Santa Margarita River in 2009; the observation was confirmed via a fin clip sample that was genetically analyzed by NOAA NMFS (Evans and Rouse pers. comm. 2009 & NOAA 2010a).

The wide-range of climatic factors that control the distribution of *O. mykiss* in the region appear to be summer air temperatures, annual precipitation, and the severity of winter storms, the latter having its effect by determining the power of high-flow events that organize the distribution and extent of suitable instream steelhead habitat. All of these factors are likely to undergo a permanent shift as part of the anticipated CO_2 (cabon dioxide) induced climate change. The region's frequent wildfires also strongly influence the sediment loads of streams, and thus the distribution of steelhead habitat. The overall wildfire regime is also likely to undergo a permanent shift in response to climate change. The magnitudes of these shifts and the significance of their direct and interaction effects on stream habitats are not yet clear, and thus how to plan for anticipated climate change (NMFS 2009b).

Although most of the coastal rivers and streams south of Malibu Creek are highly impacted or modified and no longer support steelhead (NOAA 2000), it is speculated that if

precipitation levels are adequate and conservation efforts throughout the Southern California Steelhead DPS result in increased steelhead populations, the possiblity that stealhead will stray from other systems and attempt to re-colonize Base drainages exists (as seen in San Mateo Creek in 1997) (USWFS 1998g).

F.16.3. Threats

Water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat and/or resulted in direct mortality of juvenile salmonids. Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flows necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, gravel recruitment and transport of large woody debris. Physical features of dams, such as turbines and sluiceways, have resulted in increased mortality of both adults and juvenile salmonids. Natural resource use and extraction leading to habitat modification have potentially significant direct and indirect impacts to steelhead populations. Land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation have significantly altered fish habitat quantity and quality. Associated impacts of these activities include: 1) alteration of streambanks and channel morphology; 2) alteration of ambient stream water temperatures; 3) degradation of water quality; 4) reduction in available food supply; 5) elimination of spawning and rearing habitat; 6) fragmentation of available habitats; 7) elimination of downstream recruitment of spawning gravels and large woody debris; 8) removal of riparian vegetation resulting in increased stream bank erosion; and 9) increased sedimentation input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris. Introduced predators and competitors are also affecting steelhead populations. Furthermore, climatic shifts over the last decade appear to have resulted in decreased ocean productivity which may exacerbate degraded freshwater habitat conditions to some degree. Environmental conditions such as these have gone largely unnoticed until recently, when salmonid populations have reached critically low levels (NOAA 2009b).

Additionally, non-native crayfish, fishes, and bullfrogs have been noted by the NMFS as being particularly abundant in the San Mateo Creek, San Onofre Creek, and Santa Margarita River watersheds compared to the rest of the Santa Catalina Gulf Coast - Biogeographic Population Group (NMFS 2009b).

F.16.4. Recovery Strategy Goals

In September 2007, the NMFS Southwest Regional Office drafted their 2007 Federal Recovery Outline for the DPS of Southern California Steelhead. The Southern California Steelhead DPS for *O. mykiss* is identified as extending from the Santa Maria River in San Luis Obispo County south to the Tijuana River at the U.S. - Mexican border, and includes those portions of coastal watersheds which are at least seasonally accessible to steelhead entering from the ocean (NMFS 2007).

According to the NMFS Southern California Steelhead Recovery Plan, in order for the species to recover it needs substantially higher numbers of returning adults, successful spawning and rearing in freshwater and estuarine environments, and successful migration

of juveniles to the ocean. To achieve these goals, it is critically important to preserve and restore the species' existing habitat, as well as restore its access to historically important spawning and rearing habitats. Individual watersheds, and in some cases, groups of watersheds must have the capacity to support self-sustaining populations of steelhead in the face of natural variation in environmental conditions such as droughts, floods, variable ocean rearing conditions, wildfires, and long-term climate changes (NMFS 2012a).

The following objectives for recovery of the DPS of Southern California Steelhead were also identified in the NMFS recovery plan:

1. Prevent steelhead extinction by protecting existing populations and their habitats.

2. Maintain current distribution of steelhead and restore distribution to previously occupied areas.

3. Increase abundance of steelhead to viable population levels, including the expression of all life history forms and strategies.

4. Conserve existing genetic diversity and provide opportunities for interchange of genetic material between and within viable populations.

5. Maintain and restore suitable habitat conditions and characteristics to support all life history stages of viable populations.

6. Conduct research and monitoring necessary to refine and demonstrate attainment of recovery criteria (NMFS 2012a).

F.16.5. Management

A programmatic BA for steelhead on the Base is currently being drafted to initiate consultation with the NMFS. Until the BA and subsequent BO are issued, Camp Pendleton will continue to abide by the existing Riparian BO, and consult/cooperate with the NMFS and CDFG for the monitoring and management of the southern steelhead trout (Rouse pers. comm. 2012). NMFS recognizes that the lower portion of San Mateo Creek, which passes through Camp Pendleton, serves mainly as a migration corridor. NMFS also recognizes that Camp Pendleton has worked closely with the USFWS to develop and implement a riparian management program to protect federally listed species that are riparian dependent. Although this riparian management program was developed for other USFWS-listed species, the program likely provides benefits to steelhead and its habitat, as well. NMFS expects to engage Camp Pendleton in an ESA Section 7 consultation that will evaluate the effects of its activities, including implementation of its riparian management strategy for San Mateo Creek, on steelhead and its habitat. If new or modified management measures are needed to protect and conserve steelhead and its habitat on Camp Pendleton, they will be developed through this Section 7 process (NMFS 2004). Camp Pendleton believes that steelhead (when present) benefit directly and indirectly from ongoing management efforts guided by the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) and the Riparian Ecosystem Conservation Plan (Appendix C). Ongoing efforts include, but are not limited to: rehabilitation efforts of estuarine/beach areas that are temporarily disturbed

from nonroutine maintenance and construction activities, exotic vegetation control, control of exotic fish populations, groundwater monitoring in drainages (San Mateo Creek) and avoidance and minimization of impacts to riparian and estuarine habitats.

Environmental regulations and restrictions that apply to the steelhead, its habitat and other threatened and endangered species on Base are provided to all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2007).

The U.S. Marine Corps has consulted, and will continue to consult, with NMFS on projects that could affect steelhead, such as an initiative to remove abandoned holding ponds and other water-diverting structures from the San Mateo Creek bed to restore the creek to a more natural condition. The comprehensive BA that Camp Pendleton is currently preparing will address the effects of military-authorized activities on steelhead populations aboard the Base. This BA also will include current and proposed steelhead management measures. Upon completion of this consultation, the Base will implement the management measures and abide by the terms and conditions of the BO as part of the INRMP.

In cooperation with NMFS and CDFG, existing pools were monitored beginning in the summer of 2001 to determine if trout were able to survive in San Mateo Creek (MCBCP 2003b). Exotic vertebrates are removed when found during monitoring events. During the June 2005 monitoring event, no steelhead were found in the existing pools. The Base is participating in a watershed-wide program to manage the southern steelhead in the San Mateo Creek system. The planning group consists of State, local and federal agencies, as well as other watershed stakeholders including private citizens and conservation organizations.

The Base continues to cooperate with CDFG personnel in conducting steelhead surveys and exotics control measures aboard Camp Pendleton in anticipation of expected requirements of a forthcoming BO. The Base has also provided access and logistical support for State-funded efforts to remove exotic animal species from reaches of San Mateo Creek within the Cleveland National Forest. Camp Pendleton has hosted numerous site visits for a variety of scientific personnel and other organizations for the purpose of scientific data collection and documenting the physical and biological attributes of the watersheds on Base. Since 2003 a fisheries biologist has been on staff to manage the complex steelhead, tidewater goby and other fisheries issues aboard Camp Pendleton. Base representatives regularly attend meetings to coordinate local efforts to address steelhead issues with federal and State agencies and other interested organizations.

Planned actions that support management of the Southern California Steelhead include:

- Prepare and implement programmatic BA.
- Continued implementation of the riparian BO.

F.17. SOUTHWESTERN WILLOW FLYCATCHER (*EMPIDONAX TRAILLII EXTIMUS*)

The southwestern willow flycatcher is a small, Neotropical migratory bird that weighs about 0.42 ounces and is approximately 15 cm long. It has a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. Two parallel wingbars are visible and the eye-ring is faint or absent. The upper mandible is dark and the lower is light with a yellowish tone. The southwestern willow flycatcher breeds in relatively dense growths of trees and shrubs in riparian ecosystems and other wetlands, including lakes (e.g., reservoirs). Habitat requirements for wintering are not well known but include brushy savannah edges, secondary growth, shrubby clearings and pastures, and woodlands near water.

F.17.1. Status

The southwestern willow flycatcher was State listed as an endangered species by the CDFG in 1990, and federally listed as an endangered species by the USFWS on 27 February 1995 (USFWS 1995c). On 22 July 1997, the USFWS designated critical habitat for this species, but it was later remanded and vacated (USFWS 1997a). On 19 October 2005, the USFWS issued a revised designation of critical habitat, which exempted all lands owned by Camp Pendleton from the final critical habitat designation pursuant to Section 4(a)(3) of the ESA based on a legally operative INRMP that provides a benefit to the southwestern willow flycatcher (USFWS 2005c). A recovery plan was published by the USFWS on 30 August 2002 (USFWS 2002a). Revised critical habitat was proposed by the USFWS on 15 August 2011, which calls for continued exemption of Base lands; however, it has not been finalized.

F.17.2. Distribution and Occurrence

The historical breeding range of the southwestern willow flycatcher included: southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico. The flycatcher's current range is similar to its historical range, but the quantity of suitable habitat within that range is much reduced from historical levels. The flycatcher occurs from near sea level to over 2,600 m, but is primarily found in lower elevation riparian habitats. Throughout its range, the flycatcher's distribution follows that of its riparian habitat; relatively small, isolated, widely dispersed locales in a vast arid region. Historically, the southwestern willow flycatcher was common in all lower elevation riparian areas of the southern third of California, including the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Drainage systems where the flycatcher persists include: the Colorado, Owens, Kern, Mojave, Santa Ana, Santa Margarita, San Luis Rey, San Diego, Santa Clara, Santa Ynez, Sweetwater and San Dieguito rivers; the Temecula, Pilgrim, and San Mateo creeks; and the San Timoteo wash (USFWS 2002a). The southwestern willow flycatcher may arrive in breeding habitat as early as March and may be present until September. It nests in typically even-aged, structurally homogeneous, dense stands of trees and shrubs approximately 4-7 m tall with a high percentage of canopy cover and dense foliage from 3-4 m above the ground surface in a fork or on a horizontal branch of a medium-sized bush or small tree. Nesting southwestern willow flycatchers prefer willow (*Salix* spp.), seep willow (aka mulefat, *Baccharis* spp.), boxelder (*Acer negundo*), stinging nettle (*Urtica* spp.), blackberry (*Rubus* spp.), cottonwood (*Populus* spp.), arrowweed (*Tessaria sericea*),

tamarisk (aka saltceder, *Tamarix ramosissima*), and Russian olive (*Eleagnus angustifolia*) (USFWS 2002a). They invariably nest in riparian ecosystems in the arid southwestern U.S. and possibly extreme northwest Mexico. These riparian habitats are associated with rivers, swamps, and other wetlands, including lakes and reservoirs. Most of these habitats are legally classified as wetlands: palustrine and lacustrine forested wetlands and scrub-shrub wetlands, however, some are non-wetland riparian forests. Surface water or saturated soil are typically, but not always, present year-round or seasonally, and ground water is generally at a depth of less than 2 or 3 m within or adjacent to nesting habitat (USFWS 2002a).

Migration routes and wintering range for the southwestern willow flycatcher are not well known; it is thought that this species winters in Mexico, Central America, and perhaps northern South America. In the last 50 years, the southwestern willow flycatcher population has declined sharply range-wide. Since 1992, more than 800 historic and new locations have been surveyed range-wide to document the status of the species. When the southwestern willow flycatcher was listed as endangered in 1995, approximately 350 territories were known to exist. In 2001, the minimum known number of southwestern willow flycatcher territories was 986 (USFWS 2002a). At the end of 2007, 1,299 flycatcher breeding territories were estimated to occur throughout southern California, southern Nevada, southern Utah, southern Colorado, Arizona, and New Mexico. Some of the flycatcher breeding sites with the highest number of territories are found along the middle Rio Grande and upper Gila River in New Mexico, and Roosevelt Lake and the San Pedro and Gila River confluence area in central Arizona (USFWS 2011c).

The southwestern willow flycatcher's singing male population on Camp Pendleton has remained fairly small over the years, ranging from a low of 3 singing males detected in 1987 to a high of 26 detected in 1991 (Table F-9). Although southwestern willow flycatcher territories have been recorded at least once in as many as ten separate drainages on Base since the 1980s, the Santa Margarita River is the only drainage where males have consistently occurred. Table F-9 provides a summary of the distribution and abundance of singing male flycatchers (or territories) observed in different drainages on Camp Pendleton between 1981 and 2001. In 2001, polygamy among flycatchers, with one male holding more than one territory, was first documented on Base. Since then, the Base has been tracking the number of territories for this species instead of the number of singing males. Figure 3-18 illustrates the general distribution of the southwestern willow flycatcher on Camp Pendleton. Table F-10 depicts the number of resident Southwestern Willow Flycatchers detected on Base from 2000 to 2010.

TABLE F-9. THE DISTRIBUTION AND ABUNDANCE OF SINGING (TERRITORIAL) MALE SOUTHWESTERN WILLOW FLYCATCHERS OBSERVED ON DIFFERENT DRAINAGES AT CAMP PENDLETON, 1981 TO 2000, AND TOTAL NUMBER OF TERRITORIES IN 2001

	DRAINAGE[d]															
Year	**SMR**	**NC**	**HC**	**CC**	**SMC**	**SOC**	**PDL**	**LFC**	**AC**	**FC**	**DLC**	**FBC**	**RC**	**WC**	**PC**	**Total**
1981[b]	5		ns			na					na				na	5
1982[b]	10		ns			na					na				na	10
1983[b]	10		ns			na					na				na	10
1984[b]	16		ns			na					na				na	16
1985[b]	15		ns			na					na				ns	15
1986[b]	17		ns	ns	na	na	ns	na	ns	ns	ns	ns	ns	ns	2	19
1987[b]	na		ns	ns	0	0	ns	0	ns	ns	na	ns	ns	ns	3	3
1988[b]	23		ns	ns	na	na	ns	na	ns	na	na	0	ns	ns	2	25
1989[b]	16		ns	0	0	0	0	0	0	0	0	0	0	0	2	18
1990[b]	19		ns	0	0	0	0	1	0	0	0	0	0	0	3	23
1991[b]	19		ns	0	0	0	0	1	0	1	3	0	0	0	2	26
1992[b]	3		ns	0	0	0	1	0	0	0	3	0	0	0	0	7
1993[b]	6		ns	0	0	0	0	1	0	0	0	0	0	0	2	9
1994[b]	9		ns	0	0	7	0	3	0	0	0	0	0	0	4	23
1995[c]	9		1	0	0	0	0	2	0	0	1	1	0	0	4	18
1996[c]	12		0	0	0	0	0	3	0	0	0	0	0	0	2	17
1997[c]	16	0	0	ns	1	0	0	0	0	0	0	0	0	0	2	19
1998[c]	20	0	0	0	0	0	0	0	0	0	0	2	0	0	0	22
1999	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
2000	17	ns	0	0	0	0	0	0	0	0	0	1	0	0	0	18
2001[e]	19	0	0	0	0	0	0	0	0	0	0	1	0	0	0	20

[a] (**na**) survey performed but no data available, (**ns**) no survey performed.

[b] Territorial males were not classified as single, paired, unknown or transient for survey years 1981 – 1994.

[c] 1995 to 1998 the LBV and the southwestern willow flycatcher were simultaneously surveyed and field hours were noted for the LBV. Although field hours were not explicitly listed the for southwestern willow flycatcher, it is assumed to be the same as for the LBV.

[d] **Drainages**: Santa Margarita River (**SMR**), Newton Canyon (**NC**), Hidden Canyon (**HC**), Christianitos Creek (**CC**), San Mateo Creek (**SMC**), San Onofre Creek (**SOC**), Piedre de Lumbre (**PDL**), Las Flores Creek (**LFC**), Aliso Creek (**AC**), French Creek (**FC**), De Luz Creek (**DLC**), Fallbrook Creek (**FBC**), Roblar Creek (**RC**), Windmill Canyon (**WC**), Pilgrim Creek (**PC**).

[e] Flycatcher counts starting in 2001 are for the total number of territories. In 2001, surveyors first observed polygyny. It became easier to start counting territories instead of territorial males (one male may have more than one territory).

[f] Sources for Camp Pendleton flycatcher data: 1981 – 1991 (Griffith Wildlife Biology 1997b), 1992 (Pavelka 1994), 1993 (Pavelka, 1994), 1994 (USFWS 1995d), 1995 (Kus 1996), 1996 (Griffith Wildlife Biology 1997b), 1997 (Griffith Wildlife Biology 1998), 1998 (Griffith Wildlife Biology 1999a), 1999 (Griffith Wildlife Biology 1999c), 2000 (Kus 2001), and 2001 (Kus and Ferree 2003).

TABLE F-10. RESIDENT SOUTHWESTERN WILLOW FLYCATCHER POPULATION ESTIMATES FOR CAMP PENDLETON, 2000 TO 2010

Year	Number of Resident Southwestern Willow Flycatchers
2000	28
2001	35
2002	36
2003	38
2004	42
2005	32
2006	31
2007	26
2008	15
2009	17
2010	16

[a] Source for Camp Pendleton flycatcher data: 2000 – 2010 (USGS 2010a)

F.17.3. Threats

Rangewide population declines have been observed in recent years (Howell and Kus 2009). The factors contributing to the decline of the southwestern willow flycatcher populations are attributed to human disturbance, nest parasitism by cowbirds, and permanent or long-term loss and degradation of nesting habitat and riparian woodlands. Habitat loss and degradation are due to urban, recreational, and agricultural developments, as well as diminished water quality, fires, water projects, livestock grazing, and changes in the riparian plant community caused by exotic plant species.

On Camp Pendleton, southwestern willow flycatchers have not responded as dramatically to cowbird control as the Least Bell's vireos and populations have remained fairly constant at under two dozen territories for the past two decades, suggesting that factors other than brood parasitism and the availability of additional apparently suitable habitat to support population expansion are inhibiting their recovery (Griffith Wildlife Biology 1999c & USFWS 2002a).

F.17.4. Recovery Strategy Goals

Due to the broad geographic range and site variation of the southwestern willow flycatcher, recovery is being approached by dividing the flycatcher's range into six recovery units, which are further divided into management units. This provides a strategy to characterize flycatcher populations, structure recovery goals, and facilitate effective recovery actions

that should closely parallel the physical, biological, and logistical realities on the ground (USFWS 2002a). The Coastal California Recovery Unit is comprised of four Management Units: Santa Ynez, Santa Clara, Santa Ana and San Diego; Camp Pendleton is located in the San Diego Management Unit.

The overall objective for the flycatcher is to attain a population level, and the quantity and distribution of habitat sufficient to provide for long-term persistence of metapopulations, even in the face of local losses (e.g., extirpation). This requires that the threats that led to listing the flycatcher as an endangered species be ameliorated. The specific objectives are to recover the southwestern willow flycatcher to the point that it warrants reclassification to "threatened" status, and then further to the point where it can be removed from the list of threatened and endangered species. The estimated date for downlisting is 2020, and for delisting is 2030; however, observed population declines over the last few years suggest that these dates may not be feasible without rangewide population threat reassessment (Howell and Kus 2009 & Beck, USFWS pers. comm. 2010).

According to the USFWS, the minimum recovery criteria (or goals) for the flycatcher to achieve reclassification to threatened in the Coastal California Recovery Unit are 275 territories, from the 186 current territories. The San Diego Management Unit criteria to achieve reclassification to threatened are 125 territories from the 101 current territories. There are a total of 16 rivers and creeks that are identified as suitable habitat within the Coastal California Recovery Unit where recovery efforts should be focused. Of those 16 river and creek reaches, 7 have been identified as suitable breeding habitats on Camp Pendleton. These habitats are 1) San Mateo Creek, from San Mateo Road crossing to the Pacific Ocean; 2) San Onofre Creek, from below Camp Horno to the Pacific Ocean; 3) Las Flores Creek, from Basilone Road to the Pacific Ocean; 4) Fallbrook Creek, from the Naval Weapons Station boundary to the Santa Margarita River; 5) Santa Margarita River, from confluence with De Luz Creek to the Pacific Ocean; 6) De Luz Creek, from De Luz Road to the Santa Margarita River; and 7) Pilgrim Creek, from Vandegrift Road to the confluence with the San Luis Rey River (USFWS 2002a).

The flycatcher recovery plan does not identify explicit recovery criteria (or goals) for flycatcher territories specifically on Camp Pendleton; however, it identifies an overall increase of flycatcher territories (from 101 to 125 territories) in 16 river and creek reaches within the Coastal California Recovery Unit, in which Camp Pendleton is located. Camp Pendleton continues to support obtaining the San Diego Management Unit goal of 125 territories, as well as expanding and improving habitat available for the flycatcher basewide (USFWS 2002a).

In 2004, Camp Pendleton supported 25 flycatcher territories, and in 2008, Camp Pendleton supported 9 flycatcher territories. The southwestern willow flycatcher population in California appears to be experiencing a statewide decline, rather than one isolated to Camp Pendleton. Populations on the Kern River and the lower San Luis River have experienced steep declines or have been eradicated in recent years (Howell and Kus 2009).

According to Howell and Kus (2009), it is encouraging that two flycatchers immigrated onto the Base in 2008, suggesting that the habitat on Camp Pendleton may be more suitable

to flycatchers than that in nearby riparian drainages. This may be partially a result of management actions on Base, specifically the restoration of riparian habitat, including the removal and treatment of invasive exotics such as giant reed. The flycatcher population on Base has receded to the midstream portions of the Santa Margarita River, bypassing areas further south that were historically occupied, but still contain giant reed. Prioritizing the opportunity to focus on exotic removal, treatment, and habitat restoration to ready these areas for re-colonization by southwestern willow flycatchers in the future will likely enhance the recovery of flycatchers on Base (Howell and Kus 2009).

In order to delist the southwestern willow flycatcher from the Federal List of Endangered and Threatened Wildlife and Plants, the 2002 Recovery Plan recommends that: 1) a minimum of 1,950 territories are geographically distributed among all Recovery and Management Units, and that twice the amount of habitat is provided to maintain these territories over time; 2) these habitats must be protected from threats to assure maintenance of these populations and habitat for the foreseeable future through development and implementation of conservation management agreements; and 3) all of these delisting criteria must be accomplished and their effectiveness demonstrated for a period of 5 years (USFWS 2011c).

F.17.5. Management

The Base has implemented management programs for protecting the southwestern willow flycatcher and enhancing its breeding habitat. Management efforts are guided by the Riparian Ecosystem Conservation Plan (Appendix C) and under this plan, Camp Pendleton maintains a minimum baseline of 485.6 ha and an additional bank of 404.7 ha of riparian habitat to support the southwestern willow flycatcher and other riparian species. The southwestern willow flycatcher management measures contained in the Riparian Ecosystem Conservation Plan have been implemented continuously since the completion of the Plan in 1995 and were incorporated in and have been managed through this INRMP since 2001.

Current basewide management practices that benefit the southwestern willow flycatcher directly and indirectly include: 1) annual monitoring of population levels and distributions of the southwestern willow flycatcher; 2) incorporating survey data into the GIS species distribution database to update Environmental Operations Maps and for utilization in conservation awareness and education programs (see Section 4.3.8.); 3) exotic vegetation control including *Arundo* and *Tamarix* spp. removal and control (see Section 4.4.1.3. and Table 4-7); 4) exotic animal control (annual cowbird control activities; see Section 4.3.3.2. and Table 4-3); 5) programmatic instructions that limit impacts to the southwestern willow flycatcher and its habitat; and 6) monitoring groundwater levels and managing basin withdrawals managed to avoid loss and degradation of habitat quality.

Programmatic instructions are provided for users and residents of the Base to avoid and minimize adverse impacts to the southwestern willow flycatcher and its habitat. Avoidance and minimization impacts from training activities and other Base operations include: 1) restricting vehicle movement in riparian areas to existing roads; 2) requiring helicopters to be operated in excess of 61 m AGL over riparian areas (except when landing or taking-off) between 15 March and 31 August; 3) restricting ground troop movements in riparian areas

to existing roads, trails and crossings; and 4) prohibiting bivouacking in riparian areas. Environmental regulations and restrictions that apply to the southwestern willow flycatcher and other threatened and endangered species on Base are provided to all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and is depicted on the Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2007 and Figure 2-1).

The Base annually surveys all suitable riparian habitats to monitor population levels and distributions of the endangered southwestern willow flycatcher (flycatchers are surveyed for by detecting singing males). Since 2000, the U.S. Geological Survey – Biological Resources Division (USGS-BRD) has conducted the annual southwestern willow flycatcher monitoring. Personnel at the USGS-BRD San Diego Field Station are recognized experts on southwestern willow flycatcher ecology and are active in its recovery efforts at the local, regional and national level. Camp Pendleton has forged a strong partnership with the USGS-BRD as part of its endangered species management program which includes the southwestern willow flycatcher. In addition to the annual monitoring, Camp Pendleton has either hosted or funded the following USGS-BRD research efforts aboard the Base that directly or indirectly benefit the southwestern willow flycatcher: 1) flycatcher demographic studies using banded flycatchers; 2) examination of vegetation characteristics at southwestern willow flycatcher nest sites; 3) riparian habitat use by birds (including southwestern willow flycatcher), with an emphasis on habitat dominated by exotic vegetation; 4) response of southwestern willow flycatcher to removal of exotic vegetation; 5) use of exotic riparian vegetation as nesting substrate; and 6) use of non-listed birds as indicators of suitable southwestern willow flycatcher habitat.

A planned action that supports management of the southwestern willow flycatcher includes:

- Continued implementation of the riparian BO (Section 4.3.2.1.).

F.18. SPREADING NAVARRETIA (*NAVARRETIA FOSSALIS*)

Spreading navarretia is a member of the Phlox family (Polemoniaceae) that is a low, spreading or ascending, annual herb 10.2 to 15.2 cm tall, which flowers from May through June. The lower portions of the stems are mostly bare. The leaves are soft and finely divided, 1.0 to 5.1 cm long, and are spine-tipped when dry. The flowers are white to lavender-white with linear petals that are arranged in flat-topped compact leafy-heads. The fruit is an ovoid, two-chambered capsule. This species has evolved mechanisms to self-pollinate (USFWS 2004i). Seeds of this plant are likely dispersed locally by the flow of water throughout the vernal pool or alkali wetlands in which this plant occurs; more distant dispersal is likely primarily accomplished by the spiney flowerheads clinging to the fur of larger mammals, or via mud containing seeds stuck to birds that visit these wetlands (USFWS 2004i).

In San Diego County, spreading navarretia appears to be endemic in vernal pool

complexes. In Riverside County, it occurs in relatively undisturbed and moderately disturbed vernal pools, and in alkali playa habitat near Hemet. The species also occurs in relatively undisturbed and moderately disturbed vernal pools and alkali playa habitats along the San Jacinto River in Riverside County and on Camp Pendleton (USFWS 1998b).

F.18.1. Status

Spreading navarretia was listed as federally threatened on 13 October 1998 (USFWS 1998e). In response to a court order, critical habitat for this species was proposed on 7 October 2004 (USFWS 2004i), with final designation of critical habitat published on 18 October 2005 (USFWS 2005h). The USFWS found that the INRMP for Camp Pendleton provides a sufficient benefit for spreading navarretia, and all lands on Camp Pendleton are exempt from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 2005h).

Spreading navarretia is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998b).

On 10 June 2009, the USFWS issued a proposed revised critical habitat designation for the species in order to include all areas essential to its conservation; the 59 ha of critical habitat proposed on Base within the Stuart Mesa and Wire Mountain subunits was exempted under 4(a)(3)(B) of the Sikes Act. On 7 October 2010, a final critical habitat designation of 6,720 ac was made by the USFWS. On Base essential habitat was exempted from critical habitat designation due to the Base's INRMP providing a sufficient conservation benefit to the species (USFWS 2010f).

F.18.2. Distribution and Occurrence

Spreading navarretia known from widely disjunct and restricted populations extending from the Santa Clarita region of Los Angeles County, east to the western lowlands of Riverside County, south through coastal and foothill San Diego County, and even further south to San Quintin, Baja California, Mexico. It is found at elevations between sea level and 1,295.4 m, on flat to gently sloping terrain in vernal pools, alkali grassland, alkali playa, and alkali sink habitats. Occasionally, the species also occurs in ditches and other artificial depressions in degraded vernal pool habitat (USFWS 2004i).

Fewer than 45 populations exist in the United States. Nearly 60% of these populations are concentrated in three locations in California: on Otay Mesa in southern San Diego County, along the San Jacinto River in Riverside County, and near Hemet in western Riverside County (USFWS 1998b). The two largest populations occur in Riverside County and have been estimated to support 375,000 and 100,000 individuals, respectively, within 3 ha of habitat. Most other populations contain fewer than 1,000 individuals and occupy less than 0.5 ha of habitat. The USFWS estimates that less than 120 ha of habitat in the United States is occupied by the species (USFWS 1998e). In Mexico, spreading navarretia is known from fewer than 10 populations clustered in three areas: along the international border, on the plateaus south of the Rio Guadalupe, and on the San Quintin coastal plain (USFWS 2004i). On Camp Pendleton spreading navarretia has been found in 9 vernal pools basewide: 7 pools in the Wire Mountain housing development area, and 2 pools within the Oscar One training area (Figure 3-39). The known locations of spreading navarretia on Base are a compilation of multiple survey efforts (some basewide, others site-specific) over many

years. During Base surveys in the late 1980s, Pacific Southwest Biological Services, Inc. (1986, 1987, 1988, & 1990) identified only one population of spreading navarretia on the mesa east of Newton Canyon. In 1993, the species was found in at least three additional nearby sites (Dudek 1996). Spreading navarretia was also discovered in a large vernal pool at the edge of a lawn near Camp Del Mar, west of Interstate 5, near the southern end of the Base. During their basewide surveys in 1997, RECON (2001b) identified nine vernal pools with spreading navarretia (Figure 3-39).

F.18.3. Threats

Spreading navarretia, as with other vernal pool species, is threatened by the loss of vernal pool habitat. In general, vernal pool habitat in San Diego County has declined 97% (from 23,859 ha to 838 ha) since the early 1900s (Oberbauer 1996). Spreading navarretia is threatened by habitat destruction and fragmentation from urban and agricultural development, pipeline construction, alteration of hydrology and floodplain dynamics, excessive flooding, channelization, off-road vehicle activity, trampling by cattle and sheep, weed abatement, fire suppression practices (including dicing and plowing to remove weeds, and creation of fire-breaks), and competition from exotic plant species (USFWS 1998e).

F.18.4. Recovery Strategy Goals

The recovery strategy for spreading navarretia is to ensure the long-term conservation of this species. The recovery plan states that removal of this species from protection under the Endangered Species Act should only be considered when populations have secure habitat, populations are stabilized or increasing (and where necessary, new populations are established), and populations are shown to be self-sustaining. The recovery strategy for spreading navarretia is part of the USFWS Recovery Plan for conserving and enhancing southern California vernal pool ecosystems, with specific emphasis on stabilizing and protecting existing populations of Riverside fairy shrimp, San Diego fairy shrimp, San Diego button-celery, San Diego mesa mint), Otay mesa mint and California Orcutt grass, so that these species may be reclassified from endangered to threatened status (USFWS 1998b).

The Vernal Pools of Southern California Recovery Plan identifies eight distinct Management Areas in southern California, and Camp Pendleton is located in the San Diego - North Coastal Management Area. Before delisting of spreading navarretia can be considered, the species must first be stabilized by conducting surveys and research essential to the conservation of the species. Camp Pendleton's vernal pool complexes and their associated species have been identified as necessary to stabilize spreading navarretia and other listed vernal pool species. The vernal pool complexes identified are: Cockleburr, San Mateo, Las Pulgas, Stuart Mesa and Wire Mountain. Once the species is stabilized, delisting will be considered by the USFWS when the following criteria are met: 1) existing vernal pools and their associated watersheds are secured; 2) where necessary reestablish vernal pool habitat to the historical structure; and 3) manage and monitor habitat and listed species.

F.18.5. Management

The Base is in consultation with USFWS regarding monitoring intervals and management for uplands habitats basewide including occupied spreading navarretia habitat. Current basewide management practices that directly or indirectly benefit spreading navarretia include exotic vegetation control, erosion control, resource conservation awareness and education programs, investigative research (e.g., to examine pool and group enhancement, pool creation, and impact of signing and/or fencing), and avoidance and minimization of impacts from projects and Base activities including training. Controls on training activities include: 1) keeping bivouac/command post/field support activities at least 300 m from spreading navarretia habitat year-round; 2) keeping vehicle/equipment on existing roads (foot traffic is authorized year-round); and 3) prohibiting digging (including construction of fighting positions) in spreading navarretia habitat.

Environmental regulations and restrictions that apply to the spreading navarretia, its habitat and other threatened and endangered species on Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on both the Camp Pendleton Military Installation Map and the most current Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2007 and Figure 2-1).

Planned actions that support management of spreading navarretia include:

- Implement uplands BO and uplands species habitat conservation plan (currently in consultation with the USFWS).

F.19. STEPHENS' KANGAROO RAT (*DIPODOMYS STEPHENSI*)

FIGURE F-14. STEPHENS' KANGAROO RAT

The Stephens' Kangaroo Rat (SKR) is a small mammal of the rodent family Heteromyidae. Like other kangaroo rats, it has a large head, external fur-lined cheek-pouches used for transporting seeds to safe caches, elongated rear-legs used for hopping (up to 2 m or more in a single bound when threatened), and relatively small front legs (Animal Info 2009). The dexterous front paws are frequently used to hold seeds that the animal eats. There are five toes on each of the hind paws, and the crested tail is 1.45 times the length of the head and body. They prefer open habitat on gentle slopes for efficient movement and foraging. The average adult SKR is 27.9 to 30.5 cm in length and weighs 2.3 ounces (Bleich 1977). This species is nocturnal, spending the day in underground burrows and foraging on the surface at night when the humidty is highest, which serves to conserve water since it seldom drinks water, and

hydrates primarily through the chemical breakdown of food (USFWS 1988 & Animal Info 2009).

Adults are solitary, strongly territorial (one adult per burrow) and are characterized by a promiscuous mating system, establishing no persistent pair bonds. Reproductively active individuals have been observed year-round, although onset of estrus (in females) appears to be triggered by the onset of winter rains, and estrous cycling ceases after plants dispearse seeds. Average gestation period is 30 days, and the average number of young per litter is 2.5 (Animal Info 2009). The young are then weaned from the nest between 18 and 22 days after birth. In prosperous years, females born in the spring may reproduce their first year. Primary stressors to survivorship and reproduction may include: 1) low seed production due to drought (decreased food supply); 2) excessive predation pressure from owls, snakes, coyotes, fox, feral cats and/or invasive ants; 3) excessive competitive pressure from other rodents and/or ants who share the same resource base; 4) small and/or low density populations, which may result in reduced mating and reproduction due to Allee effects, where widely dispersed, low-density populations are less likely to find mates (small populations have increased susceptibility to environmental and demographic stochastic events); and 5) direct mortality from consumption of pesticides, trampling and road kill (USGS 2010d).

F.19.1. Status

The USFWS designated the SKR as federally endangered on 30 September 1988 (USFWS 1988). Critical habitat has not been designated for this species, nor has a final recovery plan been approved. A draft recovery plan is available (USFWS 1997b). On 19 August 2010, a petition to remove the Stephens' Kangaroo Rat from the Federal List of Endangered and Threatened Wildlife was found to be not warranted at this time after a 12 month review (USFWS 2010e). On 22 July 2011, the USFWS recommended that the SKR be dowlisted to threatened per completion of the species 5-Year Review; it was determined that the current status of the species best fits the definition of a threatened per the ESA; however, a final determination is still pending (USFWS 2011i).

The SKR was listed as a State of California threatened species on 27 June 1971 (CDFG 2008a).

F.19.2. Distribution and Occurrence

The SKR is endemic to the Perris and San Jacinto Valleys in western Riverside County and the San Luis Rey and Temecula Valleys in northern San Diego County (USFWS 1997b). The species is distributed across a range of approximately 2,849 square kilometers (km^2), in numerous small fragmented populations, where suitable habitat remains; 5% of its original habitat remains range-wide (USFWS 1997b & Animal Info 2009). The USFWS states that the SKR is frequently found in close association with dirt roads, previously and currently disturbed areas, and/or other sites with a high percentage of bare-ground (USFWS 1997b). Occupied habitats are usually described as sparse, slightly disturbed CSS or annual grassland on level or low-rolling terrain. The actual distribution of suitable habitat is normally mixed with other habitat types in a natural mosaic. The populations with the highest densities have been found in areas where the herbaceous layer still contains California native annuals, and where perennial cover is less than 30% (USFWS

1988). The SKR is most commonly associated with *Artemisia californica* and *Eriogonum fasciculatum* because these shrubs are often the most obvious elements of the habitat. The SKR reaches its highest densities in intermediate successional stage grassland communities characterized by moderate to high amounts of bare-ground, high forb cover, moderate slopes, and well-drained soils (USFWS 1997b). This species prefers grassland communities dominated by herbaceous plants rather than by annual grasses because annual herbs rapidly breakdown after drying, which results in substantial patches of bare-ground and suitable conditions for its specialized mode of locomotion of hopping (USFWS 1997b). Moderate human disturbances (e.g., certain grazing regimes, farming, off-road vehicle use, brush removal, mowing, and fires) can benefit SKR habitat by maintaining sparse shrub growth. When these factors are removed, habitat on-site may transition to denser CSS or introduced European grassland conditions which are not favorable to the SKR. However, too much disturbance may also be detrimental to the species if too excessive or intense, resulting in burrow destruction and possible changes to the vegetation community. Further research is needed to determine at what levels and intensities these disturbances become detrimental to the species (USFWS 2004k). The SKR is found from approximately 55 to 1,250 m above sea level with most populations occurring below 610 m. It is not found on extremely hard or sandy soils; gravel is a common component of soils where the animal is found (USFWS 1997b).

Population densities fluctuate greatly from year-to-year and location-to-location, and can vary more than tenfold in response to rainfall patterns (USFWS 1997b). Reported densities of SKR range between 3 and 23.7 individuals per acre during summer months; however, densities decrease to 2 to 6 individuals per acre in fall and winter (USFWS 1997b). A comprehensive, range-wide total of occupied habitat is not available.

SKR occurs at scattered localities on Camp Pendleton. The easternmost population of this species occurs in the Juliett Training area, south of the southern border of the Naval Weapons Station Detachment Fallbrook.

Surveys conducted on Camp Pendleton during 1994 to 1996 indicated approximately 330.5 ha of occupied SKR habitat (Montgomery et al. 1996, 1997). However, subsequent field studies indicated that the area of occupied SKR habitat on Base has decreased to approximately 293.2 ha (11.3% reduction), due to the apparent extirpation of this species at Range 313A, the 210 Series Ranges, and Range 116 (Tetra Tech, Inc. 1999). However, in January 2003 SKRs were again found at Range 116 (SJM Biological Consultants 2005a). Figure 3-24 illustrates the general distribution of SKR on Camp Pendleton.

For the purpose of long-term monitoring of SKR at Camp Pendleton, thirteen study grids were analyzed in November 1998 (SJM Biological Consultants 2002). This was the second study in a long-term monitoring effort designed to track the status of SKR on Base. Trapping and burrow counts were conducted at each grid in 1998. The number of individual SKR captured at each of the study grids ranged from 0 to 11, with densities ranging from 0 to 12.22 SKR per ha. Burrow counts at these sites ranged from 0 to 25 burrows per grid. SKR were not captured at five grids, including Ranges 116, 210B, 210D, 313A and 409-2. A comparison of this study to a similar 1996 baseline monitoring study is shown in Table F-11 below (Tetra-Tech, Inc. 1999 & SJM Biological Consultants 2002). In

1998, a general decrease was observed in the total number of SKR captured, its densities, and the total number of burrows counted at all grids. Decreases in SKR occurred at 9 of the 10 monitoring grids known to harbor SKR in 1996. A 63% drop was observed in the total number (all grids combined) of active kangaroo rat burrows recorded in the 1996-1998 period, from 223 burrows in 1996 down to 82 in 1998 (Table F-11).

TABLE F-11. COMPARISON OF THE NUMBER OF INDIVIDUALS CAPTURED AND DENSITY OF SKR AND DKR, AND THE NUMBER OF BURROWS COUNTED, AT THE 13 STUDY GRIDS IN 1996 AND 1998

Study Grid	Percent SKR Change 1996-1998*	1996				1998				Percent DKR Change 1996-1998*
		# SKR	Density	# Burrows	# DKR	# SKR	Density	# Burrows	# DKR	
Juliett-1	-50%	4	4.44	1	0	2	2.22	4	0	0
Juliett-2	-17%	6	5.94	18	3	5	4.95	5	15	+500%
Kilo 1	-82%	17	18.89	44	0	3	3.33	7	0	0
Kilo 2	-50%	8	8.89	5	0	4	4.44	14	0	0
116	-100%**	1	0.99	5	0	0	0	0	0	0
210B	0	0	0	0	5	0	0	0	0	-100%**
210D	0	0	0	0	0	0	0	0	0	0
313A	0	0	0	0	0	0	0	0	0	0
407-1	-33%	3	3.33	12	13	2	2.22	9	7	-46%
407-2	+17%	6	6.67	14	0	7	7.78	14	0	0
408-1	-45%	20	22.22	38	1	11	12.22	25	2	+100%
409-1	-71%	14	15.56	58	0	4	4.44	4	3	+300%**
409-2	-100%**	2	2.22	16	1	0	0	0	0	-100%
Total	**-**	**81**	**--**	**223**	**38**	**38**	**--**	**82**	**27**	**-**

[a] Stephens' Kangaroo rat (SKR); Dulzura kangaroo rat (DKR).

[b] *Percent change = the percent increase or decrease in total SKR or DKR captures from 1996 to 1998 at occupied study grids ([1998 #SKR or DKR]/[1996 #SKR or DKR] less 1.0 X 100).

[c] ** Since one of the two comparison years is zero, a percentage increase/decrease is actually not calculable.

Since DKR were present in some grids with SKR, the indicated burrow count may, or very likely does include some burrows occupied by DKR.

[d] Source for Camp Pendleton SKR data: 1996 and 1998 (SMJ Biological Consultants 2002).

In 2003, surveys for the SKR were conducted at thirteen artillery firing areas (19 through 33, excluding 20 and 30) based on the appearance of these areas having the potential to support this species. SKRs were found at five locations: Artillery Firing Areas 22, 24, 26, 31, and 32 (AMEC 2005a).

In 2004, the Base developed, in conjunction with the USGS, a SKR monitoring protocol, for proportional areas occupied that is designed to evaluate the long-term distribution of the species. A two-phased approach is utilized for sampling. The first phase involves a complete search for any potential kangaroo rat sign and measurement of habitat and environmental variables. If any potential sign is observed, two to four days of live-trapping is conducted for the second phase. Live-trapping is necessary to determine if plots are

occupied by the Stephens' kangaroo rat and/or the Dulzura kangaroo rat (*D. simulans*) (USGS 2010d). The first use of the protocol was in 2005.

Within the high suitability stratum in 2007, an increasing trend in occupancy since 2005 was observed. SKR occupied approximately 147.3 ha in 2008, in comparison to 130.7 ha in 2007, 70.8 ha in 2006, and 60.0 ha in 2005. All habitat and trapping surveys were completed between September 2008 and January 2009, and 109 SKR were captured in 22 plots. SKR detections were limited to the training areas immediately south of the Zulu Impact Area in the 409 Impact Area, Range 408A, Kilo 1, Kilo 2, AFA 31 in India. The SKR was not captured within the Juliette mitigation area along the border to the Fallbrook Naval Weapons Station (USGS 2010d).

Large fluctuations in both distribution and density over time have been documented for this species. Ten-fold changes in abundance within and among years are common. Densities also vary vastly over space due to changes in habitat conditions and natural successional dynamics. Therefore, declines in population sizes at some locations may be concurrent with increases at other locations. Because of this evidence, it is suspected that SKR primarily follow a form of meta-population dynamics, where availability of suitable habitat patches is spatially and temporally dynamic (USGS 2010d).

F.19.3. Threats

Agriculture and urban development have greatly reduced and fragmented the amount of habitat available for SKR. As a result, the species is more susceptible to the effects of grazing, off-road vehicle activity, rodenticide use, decreased genetic diversity, domestic cat predation and the potential impacts associated with climate change.

Per the 5-Year Review by the USFWS, it was concluded that threats to the SKR have been removed or their imminence, intensity, or magnitude reduced to the extent that the species is no longer in danger of extinction throughout all or a significant portion of its range. Despite the significant reduction in threats, non-conserved SKR habitat continues to be impacted by the effects of noncompatible landuses previously indicated; therefore, the species best fits the definition of a threatened species per the ESA, a species likely to become endangered within the foreseeable future, throughout all or a significant portion of its range (USFWS 2011i).

F.19.4. Recovery Strategy Goals

The draft recovery plan for the SKR was published in April 1997 (USFWS 1997b). The requirements for the species have been divided between the Western Riverside County conservation planning region and the San Diego County conservation planning region. The San Diego County conservation planning region is subdivided into two conservation planning areas; the Western San Diego County Conservation Planning Area and the Central San Diego County Planning Area. Camp Pendleton (and Fallbrook Naval Weapons Station) is located in the Western San Diego County Conservation Planning Area of the San Diego County conservation planning region. The Camp Pendleton and NWS Fallbrook populations are identified in the recovery plan as essential to the recovery of the species because they are large and not isolated from the surrounding biological community, and represent the most southern distribution of the species.

This recovery plan established draft recovery criteria for SKR and identified two criteria to be met before the species will be considered for downlisting from endangered to threatened status. These criteria are:

- Establishment of four reserves which encompass at least 6,070 ha of occupied habitat and are permanently protected, funded, and managed, and are located in western Riverside County (inside or outside the HCP planning area).
- Establishment of one ecosystem-based reserve in either western or central San Diego County that is permanently protected, funded and managed.

The SKR could be considered for delisting if the long-term survival of the species is assured by the following criteria:

- A minimum of five reserves in western Riverside County, one of which is ecosystem-based, and encompasses at least 6,677 ha of occupied habitat that is permanently protected, funded, and managed.
- Two ecosystem-based reserves in San Diego County; one reserve needs to be established in the Western Conservation Planning Area, and another in the Central Conservation Planning Area. These reserves must be permanently protected, funded, and managed.

The 1997 draft recovery plan, which has not been finalized by the USFWS to date, calls for the development of at least one "reserve" in the Western or Central San Diego Conservation Planning Area, in order to downlist the species to threatened. Further, to delist the species, at least one reserve must be developed in the Western San Diego Conservation Planning Area, either on Fallbrook Naval Weapons Station or on Camp Pendleton. In 1998, 38 individuals were captured at 8 distinct locations (SMJ Biological Consultants 2002). Their management is included in the Upland Species Management Plan that is currently undergoing consultation with the USFWS. However, the establishment of a permanent reserve on military lands does not support the military mission, or the purpose, for which Congress purchased military lands, and therefore a reserve on Base will likely be precluded in the final recovery plan pursuant to Section 4(a)(3) of the ESA based upon an operative INRMP, which provides a sufficient benefit to the species.

F.19.5. Management

In order to compensate for the loss (incidental take) of its habitat at required project sites elsewhere on Base, a SKR habitat mitigation bank was established in the Juliett area. Training activities are typically infrequent and limited in scope in this portion of the Base; thus, the potential for damage to occupied SKR habitat in this area is relatively low.

A controlled burn was conducted in the SKR mitigation bank area in the fall of 1999. The objective of this fire was to rapidly and drastically reduce herbaceous vegetation cover, since SKR are negatively affected by such dense habitat. It was hoped that the reduction of herb cover would encourage the SKR to broadly colonize the mitigation bank at the highest possible abundance levels. In order to track the post-burn progress of both vegetation

growth and SKR in the habitat bank, a two- to three-year monitoring study was initiated in 2000. The monitoring study confirmed that SKR were present in the study area during all years of the monitoring study; however, both the amount of occupied SKR habitat in acres and number of burrows counted along study plot transects varied among visits. In general, both of these SKR parameters decreased between 2000 and 2002. During this same period, the proportion of low-abundance habitat decreased while the proportion of trace-abundance habitat increased in the study area. Areas of consistent occupation by SKR throughout the study period included the northern and far eastern sections of the study area. Live-trapping surveys confirmed that SKR were the only species of kangaroo rat in the study area during the 2000 to 2003 period (Montgomery 2005b).

SKR burrow abundance and acreages of occupied habitat were negatively correlated with percent herb cover. Correlations between percent bare-ground and SKR parameters were mixed, but in general it appears that SKR increase in abundance with an increase in bare-ground, as expected from a basic understanding of the natural history of this species; the SKR is adapted for survival in very open habitats exhibiting little or no shrub cover and an abundance of bare-ground (Montgomery 2005b). However, an explanation for the exceptions to the positive correlation between the SKR and bare-ground was not apparent. Therefore, a longer monitoring study period in this area would likely clarify this relationship.

Herb cover was very low in late 1999 and early 2000, but rapidly returned to pre-fire density. Thus, the fire was successful in reducing herb cover for only a brief time. Subsequently, herb cover was relatively high throughout the study area, although a drop in cover occurred in 2002. Percent herb cover expected was predicted by rainfall quantities from the winter/spring season.

The U.S. Marine Corps is in consultation with USFWS regarding uplands habitats basewide including occupied habitat for the SKR. Until the Uplands BO is issued and a final management plan is implemented, the SKR benefits directly or indirectly from current basewide management practices including exotic vegetation control, exotic animal/predator control, control burns, use of native seed stock when conducting post-fire reseeding to enhance habitat, resource conservation awareness, and education programs.

Management practices, and environmental regulations and restrictions that avoid and minimize adverse impacts to SKR and to threatened and endangered species on Base are provided in programmatic instructions for users and residents of the Base. Programmatic instructions, natural resource, species and related environmental information for each training area and range are published in Base Order P3500.1N (*Range and Training Regulations*) and are depicted on the Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to SKR include: 1) avoidance of activities that could crush the rodents in their burrows, dig them up, or bury them; 2) limiting foot traffic and vehicle/equipment operations near known habitat to existing roads; 3) keeping bivouac/command post/field support activities at least 300 m from SKR habitat areas year-round; and 4) avoidance of digging (including constructing fighting positions) near known habitat. See Appendix N (Section 2007 and Figure 2-1).

The Base conducts annual monitoring for the species in accordance with the Stephens' Kangaroo Rat Monitoring Protocol for MCB Camp Pendleton developed by the USGS. This protocol includes trapping and habitat assessment with a Percent Area Occupied approach to allow the base to assess changes in population or possible impacts to the species, and to be able to vary management accordingly. In addition, a habitat enhancement project is underway to create more suitable habitat for the species. The project is taking place in an area that was previously occupied, but the animals have not been found there in the last four years. Mowing and fence dragging were conducted to modify the vegetation to a level preferred by SKR and some artificial burrows were created in hopes of attracting animals to the area. Pre-treatment SKR and vegetation monitoring were conducted, and post-treatment monitoring is planned for early January 2011 (results are pending) (DOD PIF 2010a).

Planned actions that support management of the SKR include:

- Implement uplands BO and uplands species habitat conservation plan (currently in consultation with the USFWS).

F.20. SWAINSON'S HAWK (*BUTEO SWAINSONI*)

The Swainson's hawk is a medium-sized hawk with relatively long-pointed wings spanning about 1.2 m, and a long square-tail. Adult females weigh 28 to 34 ounces and males are 25 to 31 ounces. The diet of the Swainson's hawk is varied with the California vole being the staple in the Central Valley; however, a variety of bird and insect species are also taken.

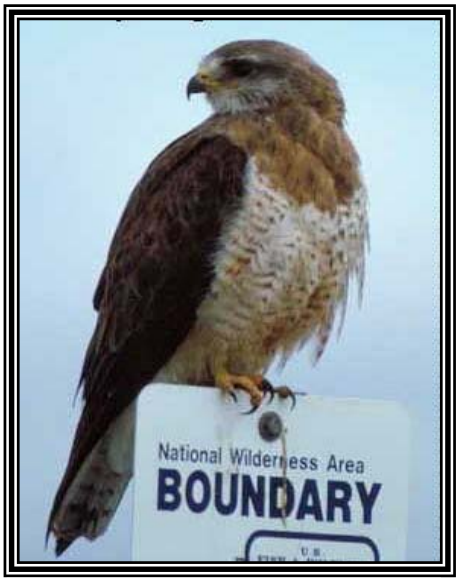

FIGURE F-15. SWAINSON'S HAWK

F.20.1 Status

The Swainson's hawk was California State listed as threatened on 17 April 1983, due to the loss of habitat and reduction of numbers (UC Davis 2007). The USFWS has designated the Swainson's hawk as Not Listed in its Entire Range; however, it receives limited protection under the MBTA.

F.20.2 Distribution and Occurrence

Swainson's hawks were once found throughout lowland California and were absent only from the Sierra Nevada, north Coast Ranges and Klamath Mountains, and portions of the desert regions of the State. Today, Swainson's hawks are restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Central Valley populations are centered in Sacramento, San Joaquin, and Yolo Counties. During historical times, Swainson's hawks may have maintained a population in excess of 17,000 pairs (CDFG 2004b). Based on studies conducted in 2005 and 2006, the statewide population is estimated to be approximately 2,081 pairs, with 95% of the State total population residing in the Central Valley (UC Davis 2007). Swainson's hawks that

breed in California may spend the winter in Mexico and South America. Central Valley birds appear to winter in Mexico and Columbia, and hawks from northeastern California have been tracked via satellite-transmitter to Argentina. Over 85% of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats. Swainson's hawks often nest peripherally to riparian systems within valleys, and utilize lone trees or groves of trees in agricultural fields (CDFG 2005b). Valley oak, cottonwood, walnut, eucalyptus and large willow trees, with a mean height of 14.8 m, are the most commonly used for nesting, with a mean nest height of 11.9 m (CDFG 2005b & UC Davis 2007). Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Unsuitable foraging habitat includes crops such as vineyards, orchards, certain row crops, rice, corn and cotton crops. Suitable nest sites may be found in mature riparian forest, lone trees or groves of oaks, other trees in agricultural fields, and mature roadside trees (CDFG 2005b).

Migrating individuals move south through the southern and central interior of California in September and October, and north in March through May. Breeding season begins early March and ends in early September.

The Swainson's hawk can be observed on Base during migration, using sites on Base to roost. The Swainson's hawk historically nested on Base, however, the last known pair nested on Base in 1933 (Bloom pers. comm. 2005).

F.20.3. Threats

The rapid conversion of agricultural lands to various residential and commercial developments is a serious threat to Swainson's hawks throughout California. Additional threats are: habitat loss due to riverbank protection projects, conversion from agricultural crops that provide abundant foraging opportunities to crops such as vineyards and orchards which provide fewer foraging opportunities, shooting, pesticide poisoning of prey animals and hawks on wintering grounds, competition from other raptors, and human disturbances at nest sites.

F.20.4. Recovery Strategy Goals

A recovery plan is not available for the Swainson's hawk. Despite the lack of a recovery plan, actions that may lead to recovery have been ongoing since the listing in 1983. These include the development of federal HCPs and State 2081 incidental take agreements within the range of the species (CDFG 2005b). Management needs of the Swainson's hawk are fairly well-known for the Central Valley breeding population. These include ensuring the availability of suitable nesting and foraging habitat through preservation of riparian systems, and groves of and lone mature trees in agricultural fields, as well as maintenance of compatible (with the Swainson's hawk) agricultural practices in grasslands, pastures and croplands. Compatible agriculture is essential to the maintenance of current Swainson's hawk populations.

F.20.5. Management

Probably the most effective benefit provided to the Swainson's hawk is the fact that Camp Pendleton remains an open, continuous area for military training and these natural areas can be used by the Swainson's hawk during its migration. However, because this species is primarily a migrant, management practices on Base that likely affect the Swainson's hawk are those enacted under the MBTA. Under the MBTA, tree-trimming activities which might disturb migrating/roosting birds are ceased during the general migratory birds' breeding season (15 February to 31 August). Habitat-clearing activities are timed to avoid breeding seasons to the maximum extent practicable, to avoid damage to active bird nests and migrating species. Raptor studies/surveys being conducted on Base were completed in spring 2005, and the final report is pending (Bloom pers. comm. 2005). When completed, the data will be incorporated into the INRMP.

F.21. THREAD-LEAVED BRODIAEA (*BRODIAEA FILIFOLIA*)

Thread-leaved brodiaea is a perennial herb that produces leaves and flower stalks from dark-brown, fibrous-coated underground corms (bulb-like storage stems that lack succulent leaves). Corms are dormant during the summer (dry season), and begin growing after the first significant fall rains saturate the soil. Leaves grow slowly throughout the winter and reach their full length in February or March. At the time of flowering, generally early summer (late April to early June), the leaves are dead or nearly-so, and next season's corms are mature. The flowering period lasts for two to three weeks starting in late April to the middle of July, and development of capsules and seeds takes four to eight weeks. Upon maturity, the three segments of the vertically oriented capsules split apart, revealing many small black seeds that are 2 to 2.5 millimeters (mm) long. The seeds are then dispersed as wind rattles the capsules, and releases the seeds (USFWS 2009o). The rate of deposit and duration of seeds in the soil until germination is unknown. However, it is likely that a majority of seeds produced in the capsules are dispersed nearby and as a result, would be expected to be scattered among the standing plants at any given occurrence. All groupings of the species found on Camp Pendleton to date reside in areas with shrink-swell soils where surface cracks are common. Seeds deposited into cracks are incorporated into the soil matrix once the soils are rehydrated and the cracks swell shut in the fall. Specific conditions conducive to triggering natural germination are unknown (AMEC 2009a).

Leaves are likely produced by the species every year; young plants may produce only leaves for a few seasons before having enough food stores to be capable of producing flower stalks. Even mature specimens may not flower every year, depending upon environmental conditions. The flower stalks (scapes) are 20 to 41 cm tall with several narrow leaves that are shorter than the scape. The tubular flowers, arranged in loose umbels, typically bloom from 1 April to 30 June, and are 9 to 12 mm long. The six perianth segments are violet (Figure 3-40), with their tips spreading. The staminodia (characteristic sterile stamens) are narrow and pointed. All species of *Brodiaea* are self-incompatible, requiring cross-pollination with another genetically distinct plant to set seed, which is typically facilitated by polliniator species. The corm is the principal means by which plants of the genus *Brodiaea* perpetuate themselves (USFWS 2004c). Seedlings produce contractile roots (specialized root form designed to shrink vertically under conditions of

seasonal drying) for the first few years. These roots swell with moisture in the wet season creating a space in the malleable clay substrate, and as the season progresses, the succulent root dries and shrinks vertically, drawing the young corm down into the ground. This vertical migration is repeated for a few years until the corm reaches deep enough, that the soil moisture level is sufficient enough, to keep the succulent root continuously hydrated. The corms of mature plants loose their contractile roots once their vertical migration is complete, and often produce 2 to 15 new adjacent cormlets annually, which are drawn laterally away from their parent corm by contractile roots (USFWS 2004c & USFWS 2009o).

F.21.1 Status

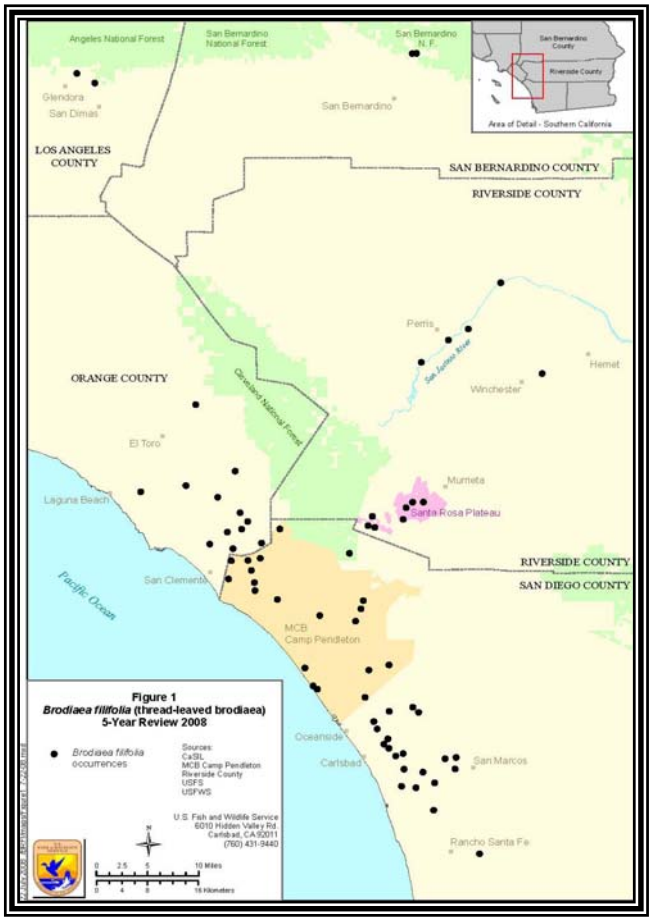

FIGURE F-16. THREAD-LEAVED BRODIAEA RANGEWIDE DISTRIBUTION
SOURCE: USFWS 2009O)

Thread-leaved brodiaea was listed by the USFWS as a threatened species on 13 October 1998 (USFWS 1998e). The USFWS found that designation of "critical habitat" for this species was not prudent at that time because such designation would provide no additional benefit over that provided by listing it on privately owned lands (USFWS 1998e).

However, on 8 December 2004, critical habitat for this species was proposed (USFWS 2004c) and final designation of critical habitat was made on 13 December 2005 (USFWS 2005d). The USFWS determined that 2,589 ha of habitat with essential features exists in Los Angeles, San Bernardino, Orange, Riverside, and San Diego Counties. Of this eligible habitat, they designated 242 ha of land within 4 units/subunits in Los Angeles and San Diego Counties, California, as critical habitat. Lands in Orange, Riverside, and San Diego Counties that are covered by approved and draft habitat conservation plans were excluded under Section 4(b)(2). Based on their review, the USFWS also found that the Camp Pendleton INRMP provides a sufficient benefit to the species, and exempted all lands on Camp Pendleton from critical habitat pursuant to Section 4(a)(3) of the ESA (USFWS 2005d). A recovery plan for thread-leaved brodiaea has not yet been completed to date by the USFWS (USFWS 2005d).

On 8 December 2009, the USFWS proposed a revised critical habitat designation of 1,532 ha in 10 units, subdivided into 28 subunits, however, Camp Pendleton was deemed exempted from critical habitat designation pursuant to Section 4(a)(3) of the ESA (USFWS 2009n). On 11 February 2011, a final revised critical habitat designation was reissued by the USFWS, and all known locations considered on Camp Pendleton for critical habitat designation were excluded under Sections 4(a)(3) of the ESA (USFWS 2011a).

Recently, the genus *Brodiaea* was moved to the newly created family Themidaceae based on genetic testing (Jepson Herbarium 2006); however, this change has yet to be uniformly recognized by taxonomists and the species is still federally listed under the Liliaceae family (RECON 2007).

F.21.2 Distribution and Occurrence

The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains in Los Angeles County (Glendora and San Dimas), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to northern San Diego County (Highland Valley). A small, isolated population of thread-leaved brodiaea is also situated just west of Rancho Bernardo in central San Diego County (USFWS 2004c). This species is usually found at elevations of 30 to 765 m in herbaceous plant communities that occur in open areas on clay soils, soils with a clay subsurface, or clay lenses within loamy, silty loam, or alkaline soils, depending on soil characteristics.

On Camp Pendleton, thread-leaved brodiaea has been found in 293 separate groupings throughout the Base. Thread-leaved brodiaea groupings are based on a GIS 7 m polygon metric. Each individual occurrence is mapped to include all plants within 7 m of it. The polygon is expanded to all individuals within 7 m of their neighbor until all brodiaea within an area are included; individuals outside of the overlapping 7 m polygon clusters are counted as a separate grouping (MCBCP 2009). Populations of *Brodiaea filifolia* on Camp Pendleton are of considerable importance not only because of the numbers of plants reported basewide, but also because they are found in more than one vegetation community and soil type, including grasslands and vernal pools. The groupings are distributed in a manner throughout the Base that likely facilitates pollen transfer among them, and also with occurrences to the north and south of Camp Pendleton (USFWS 2005d).

Thread-leaved brodiaea was first located on Base in 1993 during surveys in what are now Bravo One and Bravo Two training areas (Dudek and Associates 1994). During those surveys, several large populations (up to 2,000 individuals each) were discovered. In 1997, most of the known thread-leaved brodiaea sites were visited during a basewide rare plant survey (RECON 1999). This survey examined much of the potential thread-leaved brodiaea habitat, and an additional 14 sites were discovered. These new locations were all identified on clay pan soils within the Las Flores mesa area of Oscar Two training area and in the Talega Canyon area of the Charlie training area. Seven new sites were recorded in the spring of 2000, which brought the total number of sites to 22 (Tierra Data Systems 2000a). These sites were located in the following training and cantonment areas: Bravo One, Bravo Two, 52 Area, Alfa One, Oscar Two, India, Golf, and Lima (the Rodeo Grounds). The Bravo Two training area was surveyed a second time, and 30 thread-leaved brodiaea plants

were discovered that had not been found there previously (during an earlier survey). Figure 3-40 illustrates the general distribution of known thread-leaved brodiaea occurrences on Base in 2000.

From 2001 to 2009 a combined total of 4,514 ha of the approximately 22,258 ha of potential thread-leaved brodiaea habitat basewide has been surveyed. Currently, the 293 individual groupings of the species identified have been found to occupy 35.5 ha total basewide. Since the number of cormlets that flower annually is dependent upon precipitation levels, starting in 2007, AC/S ES decided to begin counting brodiaea groupings instead of individual plants (MCBCP 2009).

The areas on Base with the highest potential to have thread-leaved brodiaea present exhibit the following features:

- Soil series mapped as a clay soil or with a clay subsoil.
- Grassland and coastal sage scrub plant communities.
- Less than 60% slopes.
- All slope aspects (north, south, east, and west).
- Less than 792.5 m elevation (North State Resources 2007).

On 8 February 2011, the USFWS issued a revised critical habitat designation, however, all areas deemed as potential critical habitat on Base were excluded under 4(a)(3)(B) of the ESA (USFWS 2011h).

F.21.3 Threats

At the time of ESA listing, the USFWS identified several threats to thread-leaved brodiaea across its range, including habitat destruction, degradation, and fragmentation resulting from agriculture, urbanization, pipeline construction, alteration of wetland hydrology, clay mining, off-highway vehicle (OHV) activity, weed abatement, and invasive non-native plant species. By 1998, at least 25% of thread-leaved brodiaea populations or occurrences had been eliminated by urbanization and agricultural conversion (USFWS 2005d).

According to the USFWS 5-year review of the species published in 2005, the current threats to this species are essentially the same as they were at listing and include urbanization, alteration of hydrological conditions and channelization, discing, unauthorized OHV activity, grazing, and nonnative plants. Additional threats since listing include manure dumping and mowing. Development remains the most prominent rangewide threat to thread-leaved brodiaea, though the protective provisions of the ESA have had a significant impact relative to addressing this threat through the development of regional habitat conservation plans (HCPs) and section 7 consultations. As habitat continues to be placed into permanent conservation with adaptive management, the threats to thread-leaved brodiaea will be further reduced rangewide; current conservation efforts address approximately 75% of occurrences. The second most significant rangewide threat to thread-leaved brodiaea is competition from invasive, nonnative plants, which impact at least 15 of the known occurrences. Other threats from unauthorized OHV use, grazing, and manure dumping threaten specific occurrences of thread-leaved brodiaea, and while they

are not rangewide threats to the species, these threats hinder recovery of the species (USFWS 2005d).

Since thread-leaved brodiaea is dependent upon pollinator species to create seeds, another potentail threat indicated in studies is that if pollinator habitat within 1,000 m of some host plants is eliminated (e.g., developed), the number of seeds set by some plant species may be decreased by as much as 50%. Additional studies suggest that the degradation of pollinator habitat is likely to adversely affect the abundance of pollinator species (Jennersten 1988 & USFWS 2004c).

According to the USFWS, due to the threats mentioned above, both rangewide and localized, thread-leaved brodiaea remains likely to become an endangered species within the foreseeable future throughout all, or a significant portion of its range. The USFWS 5-year review of the species recommended that the current listing status for thread-leaved brodiaea remain unchanged, as threatened; however, a new listing priority number of 8C was assigned. The new recovery priority number indicates that the species faces a moderate degree of threat, and has a high recovery potential (USFWS 2005d).

F.21.4 Recovery Strategy Goals

Although a final recovery plan for thread-leaved brodiaea has not been published by the USFWS to date, Camp Pendleton continuously supports protecting and improving habitat for the species basewide. As of 2010, Camp Pendleton supports approximately 293 groupings of thread-leaved brodiaea, which occupy about 35.5 ha total (MCBCP 2009). Their management is included in the Upland Species Management Plan that is currently undergoing consultation with the USFWS.

The unpublished draft recovery plan recommends that thread-leaved brodiaea should be evaluated for delisting when, among other criteria, the following occurrences have been fully protected: 1) all known occurrences in Los Angeles and San Bernardino Counties; 2) at least 10 core occurrences in Orange County; 3) at least 10 core occurrences in western Riverside County; 4) at least 12 core occurrences on Camp Pendleton; and 5) at least 20 core occurrences in northwestern San Diego County, especially in the San Marcos area. Where possible, the draft plan proposes delineating a vegetative area of 250 m around each eligible occurrence to provide for pollinator habitat (USFWS 2004c).

F.21.5 Management

The Base is in consultation with the USFWS regarding monitoring intervals and management of uplands habitats basewide including occupied thread-leaved brodiaea habitat. Current basewide management practices that directly or indirectly benefit listed thread-leaved brodiaea include: 1) exotic vegetation control; 2) erosion control; 3) investigative research (e.g., to examine the feasibility of translocation thread-leaved brodiaea into more protected areas [such as between protected vernal pools in the Wire Mountain, Stuart Mesa, and Cockleburr areas] as a means of establishing additional core populations); 4) resource conservation awareness; 5) education programs; and 6) avoidance and minimization of impacts from projects and Base activities, including training. Controls on training activities include: keeping bivouac/command post/field support activities at least 300 m from thread-leaved brodiaea habitat year-round, keeping vehicle/equipment on

existing roads (foot traffic is authorized year-round), and prohibiting digging (including construction of fighting positions) in thread-leaved brodiaea habitat.

Environmental regulations and restrictions that apply to the thread-leaved brodiaea, its habitat and threatened and endangered species basewide are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on the most current Environmental Operations Map (updated and distributed semiannually); see Appendix N (Section 2001).

Although not required by law, AC/S ES LMB is currently considering implementation of a 250 m buffer around each brodiaea grouping identified on Base, based upon USFWS review of data collected on pollinators of thread-leaved brodiaea in the 2005 critical habitat rule, which determined that a 250 m buffer area around each population identified in the critical habitat determination would provide adequate space to support thread-leaved brodiaea's pollinators (MCBCP 2009 & USFWS 2009l).

A planned action that supports management of thread-leaved brodiaea includes:

- Implement Upland Species Management Plan (currently undergoing consultation with the USFWS).

F.22. TIDEWATER GOBY (*EUCYCLOGOBIUS NEWBERRYI*)

The tidewater goby is a small, elongate, fish rarely exceeding 50 mm in length. It is characterized by large pectoral fins. The pelvic or ventral fins are joined below the chest and belly from below the gill cover back to just anterior of the anus. Tidewater gobies have two dorsal fins set very close together, sometimes with a slightly confluent membrane. The first dorsal fin has 5 to 7 slender spines, the second has 11 to 13 soft-branched rays, and the anal fin has 11 to 13 rays. The median fins are usually dusky and the pectoral fin is transparent. Male tidewater gobies are nearly transparent, with a mottled brownish upper surface and generally remain near the burrows. Female tidewater gobies develop darker colors, often black, on the body and dorsal and anal fins. However, pectoral and pelvic fins, head and tail remain grey or brown (USFWS 2004f). Tidewater gobies primarily feed on small benthic invertebrates, crustaceans, including aquatic insect larvae, snails, and shrimp.

Tidewater gobies lifespan is generally 1 year. Reproduction occurs at all times of the year, as indicated by female tidewater gobies in various stages of ovarian development. The peak of spawning activity occurs during the spring and then again in the late-summer. Fluctuations in reproduction are probably due to death of breeding adults in early summer and colder temperatures or hydrological disruptions in winter. Reproduction takes place in water between 48 to 77 °F and at salinities of 2 to 27 parts per thousand (ppt) (Swenson 1999). Male tidewater gobies begin digging breeding burrows in relatively unconsolidated, clean, coarse sand (averaging 0.5 mm in diameter), in April or May after lagoons naturally close to the ocean (USFWS 2007f).

F.22.1 Status

The tidewater goby was federally listed as an endangered species by the USFWS on 4 February 1994 (USFWS 1994d). On 24 June 1999, the USFWS proposed to delist the northern populations of the tidewater goby and to retain the endangered status in Orange and San Diego Counties. This proposal was based on the conclusion that the southern California populations are genetically distinct and represent a distinct population segment (USFWS 1999d). On 7 November 2002, the USFWS withdrew the proposed rule to remove the northern populations of the tidewater goby from the List of Endangered and Threatened Wildlife, and it remains listed throughout its range as an endangered species under the ESA (USFWS 2002d). On 20 November 2000, the USFWS designated 10 coastal stream segments, totaling approximately 9 linear miles of rivers, streams, and estuaries in Orange and San Diego Counties as critical habitat for the tidewater goby; although many off Base areas were vacated from the 3 August 1999 proposed critical habitat designation, 8 of the 10 coastal stream segments designated as critical habitat were on Base (USFWS 2000a). However, on 28 November 2006, the USFWS proposed to exclude critical habitat designation for the tidewater goby on Camp Pendleton because they were found to be adequately protected by the Base's INRMP (USFWS 2006b). The final ruling on the re-designation of critical habitat was published in the Federal Register on 31 January 2008, and became effective 3 March 2008; all 339 ha of previously determined essential tidewater goby habitat on Camp Pendleton was excluded from this final designation under section 4(a)(3) of the ESA (USFWS 2008e). A final recovery plan for the tidewater goby was published in December 2005 (USFWS 2005i). On 19 October 2011, the USFWS published a proposed rule to re-designate critical habitat, however, all 989 ac of critical habitat proposed on Base were excluded under 4(a)(3)(B) of the ESA (USFWS 2011d).

F.22.2 Distribution and Occurrence

Tidewater gobies are endemic to California and historically ranged from Tillas Slough (mouth of the Smith River, Del Norte County) near the Oregon border to Agua Hedionda Lagoon (northern San Diego County), and are found today entirely within the original known range of the species. The known localities are discrete lagoons, estuaries, or stream mouths separated by mostly marine conditions. Tidewater gobies are absent from areas where the coastline is steep and streams do not form lagoons or estuaries. Inhabited localities are separated by as little as a few hundred meters, and up to tens of kilometers. From Tomales Bay southward to San Francisco Bay, many populations are extirpated, leaving large unnatural gaps between remaining populations. Another apparently natural gap occurs south of San Francisco Bay to San Gregorio Creek, San Mateo County. A much larger natural gap occurs from the Salinas River (Monterey County) southward to Arroyo del Oso (northern San Luis Obispo County) because of very steep shorelines preventing lagoon development. The only other large gap occurs in the Los Angeles Basin between the City of Santa Monica (western Los Angeles County) and Aliso Creek (central Orange County). The USFWS identified that the tidewater goby was historically known to occur at 124 localities (USFWS 2004f). Twenty-eight of the 124 (23%) documented locations are considered extirpated and 55 to 70 (45% to 55%) localities are naturally so small, or have been so significantly degraded over time, that long-term persistence is uncertain (USFWS 2004f).

Tidewater gobies inhabit brackish water habitats of coastal lagoons, estuaries, and marshes entirely within California. They are uniquely adapted to these waters and the uppermost brackish zone of larger estuaries, rarely invading marine or freshwater habitats. The species is typically found in water less than 1 m deep, and at salinities of less than 12 parts per thousand (ppt). It is benthic in nature, and its habitat is characterized by brackish, shallow lagoons and lower stream reaches where the water is fairly still, but not stagnant. Tidewater gobies prefer a sandy substrate for breeding, but they can be found on rocky, mud, and silt substrates, as well. They have been documented in waters with salinity levels from 0 to 42 ppt, temperature levels from 8 to 25 °C, and water depths from 25 to 200 cm. The tidewater goby appears to spend all life stages in lagoons, estuaries, and river mouths. Tidewater gobies may enter marine environments only when flushed out of lagoons, estuaries, and river mouths when sandbars are breached, typically following storm events. The tidewater goby is usaully an annual species, although some variation has been observed. Reproduction occurs year-round although distinct peaks in spawning, often in early spring and late summer, do occur. It appears that the tidewater goby is adapted to a broad range of environmental conditions (USFWS 2004f).

Factors that are generally attributed to tidewater goby population dynamics include local hydrology, water quality, presence of exotic predators and competitors, and food abundance (Lafferty et al. 1999 a, b & USFWS 2000a). Contrary to expectations that flood events would lead to the extirpation of tidewater gobies from smaller wetlands, Lafferty et al. (1999b) found that flood events may actually function as a dispersal mechanism by washing gobies out to the littoral zone of the ocean where they are carried by alongshore currents to other estuaries up or down the coast. Thus, the presence of source populations of tidewater gobies may also be an important contributing factor to population dynamics throughout the species range. Although on Base goby populations have been estimated to only comprise of approximately 6.4 to 7% of the total remaining population throughout the species range (Holland 1992), within southern California, the San Mateo, San Onofre, and Las Flores Creek populations are considered by the USFWS as the largest and most persistent populations of tidewater gobies remaining in the region, which potentially serve as important source populations for dispersal into suitable waterbodies in the area (e.g., Buena Vista Lagoon and Agua Hedonia Lagoon) (USFWS 2000a).

On Camp Pendleton, the extirpation and recolonization of gobies naturally fluctuates yearly between lagoons (Table F-12 & F-13). For example, tidewater gobies were recorded in San Onofre lagoon from 1974 to 1991, but could not be found in 1992 or 1993 (Swift et al. 1994). By 1996, gobies were again detected in the San Onofre lagoon with an estimated population of 12,265 individuals (Swift & Holland 1998). Although population estimates are considered very rough for this species, they generally reflect relative population densities among lagoons and between years. Gobies have also similarly appeared and disappeared, and vice versa, in other lagoons on Base (see Table F-12 & F-13). At the time of listing in 1994, the species was thought to be present in only four of the eight drainages on Camp Pendleton. However, by the time critical habitat was designated in 2000, the tidewater goby had been detected in all eight lagoons on Base. For the five-year period 2002-2006, tidewater gobies were consistently detected in all but French Creek and the Santa Margarita River estuary. Figure 3-29 illustrates the general distribution of the tidewater goby on Camp Pendleton.

In 2002, a tidewater goby sampling protocol was developed and published as an appendix in the 2003 monitoring report (Warburton and Lafferty 2003). The sampling protocol was developed to standardize data collection, and minimize sampling effort and impact to their habitat. Table F-13 shows the results of survey events conducted from June 2002 to December 2008. The results indicate a regular pattern; tidewater gobies are repeatedly present at the small estuaries with closed mouths. One exception has been French Creek, which had insufficient water quantities to support fish until 2005. Salinities were high (49 ppt) at French Creek in September 2005 and 2006, indicating that the lagoon dries out in the fall, and may not be able to support tidewater gobies in dry years. The dry weather of 2007 apparently led to an extirpation at French Creek; salinities were 75 ppt in July and only killifish and mullet were present. By November, the site had evaporated even more and only dead fish were observed. Although surveys by ECORP reported tidewater gobies at French Creek in March 2008, they were again absent by August 2008. A second exception is that the natural lack of a persistent sand bar at the mouth of the Santa Margarita River probably precludes the constant presence of tidewater gobies at this site. The persistent extirpation at San Mateo Creek that began in 2007 may be related to the high abundance of exotic species there, particularly predator centrarchids (sunfish) (USGS 2008).

In 2007, several of the Base's watersheds were burned in a fire, and 30-50 gobies from San Onofre, Aliso and Las Flores were captured per the USFWS in November, and brought into captivity as insurance against extirpation due to sedimentation from heavy rains. San Onofre and Aliso were determined to be the watersheds most likely to be impacted by the fire, but a USDA riparian ecologist (Ann Carlson) speculated that the remnant riparian vegetation would adequately reduce impacts of sedimentation; habitat was also reduced at Hidden Creek and Cockleburr. Seines placed in Fall 2007 and Spring 2008 indicated that gobies persisted following the fire event at all potentially impacted sites, as predicted (USGS 2008).

TABLE F-12. TIDEWATER GOBY SURVEY DATA FOR DIFFERENT DRAINAGES AT CAMP PENDLETON, 1987-2010

	Drainage							
Year	**San Mateo**	**San Onofre**	**Las Flores**	**Hidden**	**Aliso**	**French**	**Cockleburr**	**Santa Margarita**
1987	-	+	+	U	U	U	-	U
1988	-	+	+	U	U	U	-	+
1989	-	+	+	U	U	U	-	+
1990	-	+	+	U	-	-	-	+
1991	-	+	+	U	-	-	-	+
1992	U	-	+	U	UA	UA	+	U
1993	+	-	+	+	-	-	+	-
1994	UP	U	UP	UP	U	U	UP	UA
1995	+	U	UP	UP	U	U	UP	UA
1996	+	+	+	+	+	+	+	-
1997	+	+	+	+	+	+	+	-
1998	+/- [b]	+	+	+	+	+	+	-

1999	-	+	UP	UP	UP	UP	UP	-
2000	+	+	+	+	+	+/- [c]	+	+
2001	+	+	+	+	+	-	+	+
2002	+	+	+	+	+	-	+	-
2003	+	+	+	+	+	-	+	-
2004	+	+	+	+	+	-	+	-
2005	+	+	+	+	+	+	+	-
2006	+	+	+	+	+	+	+	-
2007	-	+	+	+	+	-	+	-
2008	-	+	+	+	+	+	+	-
2009	-	+	+	+	+	+	+	-
2010	+	+	+	+	-	+	+	-

[a] Survey data codes: (+) present; (-) absent; (**U**) Unknown (no sampling or survey data); (**UA**) Unknown but likely absent; (**UP**) Unknown but likely present.

[b] Extirpated by North County Transit District in early 1998.

[c] Present in June 2000, extirpated by October 2000 due to lagoon evaporation and desiccation.

[d] Source for Camp Pendleton tidewater goby data: 1987 to 1993 (Swift et al. 1994); 1994 to 1995 (Warburton and Lafferty 2002); 1996 to 1998 (Swift & Holland 1998); 1999 (Swift 1999a, 1999b); 1998 to 2001 (Holland et al. 2001); and 2002 to 2010 (USGS 2010c).

TABLE F-13. RESULTS OF TIDEWATER GOBIES DETECTION SURVEYS CONDUCTEED FROM JUNE 2002 TO DECEMBER 2010

Date/Year	San Mateo	San Onofre	Las Flores	Hidden	Aliso	French	Cockleburr	Santa Margarita
Jun-02[a]	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected
Apr-03[a]	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected
Oct-03[a]						Not Detected		Not Detected
Jun-04[a]	Detected	Detected	Detected	Detected	Detected	Not Detected	Detected	Not Detected
Sep-04[a]						Not Detected		Not Detected
Jun-05[a]	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected
Sep-05[a]						Detected		Not Detected
Sep-06[a]	Detected	Detected	Detected	Detected	Detected	Detected	Detected	Not Detected
Nov-06[a]								Not Detected
July-07[b]	Not Detected	Detected	Dectected	Detected	Detected	Not Detected	Detected	Not Detected
Nov-07[b]	Not Detected	Detected	Detected		Detected	Dry		Not Detected
March-08[b, c]		Detected	Detected	Detected	Detected	Detected	Detected	
Aug-08[b]	Not					Not		Not

	Detected					Detected		Detected
Sep-08[b, c]		Detected	Detected	Detected	Detected	Not Detected	Detected	
Dec-08[b]	Not Detected							Not Detected
Jun-09[d]		Detected	Detected	Detected	Detected	Detected	Detected	Not Detected
Oct-09[d]	Not Detected							Not Detected
Jun-10[d]	Detected	Detected	Detected	Detected	Not Detected	Detected	Detected	Not Detected
Oct-10[d]	Detected				Not Detected	Detected		Not Detected

[a] USGS 2005.

[b] USGS 2008.

[c] Survey conducted by ECORP.

[d] USGS 2010c.

F.22.3 Threats

The primary threats to the tidewater goby are direct loss of wetland habitat to coastal development, drought, and flooding (Holland 1992); though flooding may be less of a threat than previously believed (Lafferty et al. 1999b). In addition to directly affecting the goby, these factors are also responsible for: 1) indirect loss of habitat due to associated changes in salinity, temperature, and nutrient profiles; 2) increased siltation; 3) associated changes in substrate; and 4) changes in current flows. This may affect the size, distribution, and breeding and foraging activities of the goby, as well (Holland 1992). Other potential threats to tidewater gobies are non-native predators or competitors, including sunfish (*Centrarchidae*), largemouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), mosquitofish (*Gambusia affinis*), and yellowfin gobies (*Acanthogobius flavimanus*). Since tidewater gobies are known to migrate upstream into freshwater and often spawn in near freshwater conditions, they are vulnerable to predation by both estuarine and riverine non-native species (ECORP 2005).

The tidewater goby is also threatened by modification and loss of habitat as a result of coastal development, habitat channelization, water flow diversions and alterations, and groundwater overdrafting. Other potential threats to the tidewater goby include discharge of agricultural and sewage effluents, increased sedimentation due to cattle grazing and feral pig activity, summer breaching of lagoons, upstream alteration of sediment flows into the lagoon areas, habitat damage, and watercourse contamination resulting from vehicular activity in the vicinity of lagoons.

F.22.4 Recovery Strategy Goals

In the proposed draft recovery plan for the tidewater goby, there are six management units that are further divided into subunits. According to the proposed draft recovery plan, Camp Pendleton is located in Subunits SC1 and SC2 of the South Coast Management Unit. However, the Base objects to this classification because splitting the Base into two separate

subunits, each containing a substantial number of off-Base watersheds without extant goby populations, masks the Base's significant contribution to goby conservation and recovery, and holds the Base "captive" to off-Base recovery actions (USFWS 2004f).

Downlisting the goby from endangered to threatened may be considered when the following criteria are met: 1) an analysis based on scientifically credible monitoring over a 10-year period projects a 75% chance of all subunits, within each recovery unit, persisting for a minimum of 100 years; and 2) an individual management plan has been developed and implemented by the USFWS that addresses the specific threats such as habitat destruction and alteration (e.g., coastal development, upstream diversion, channelization of rivers and streams, discharge of agriculture and sewage effluents), introduced predators (e.g., centrarchid fishes), and competition with introduced species (e.g., yellowfin goby, *Acanthogobius flavimanus* and chameleon goby, *Tridentiger trigonocephalus*) to each metapopulation. This projection would incorporate a metapopulation viability analysis using a complex suite of information. A partial list of information needed for the metapopulation viability analysis includes: presence/absence data, population estimates, observed rates of extirpation and natural recolonization, results of introduction efforts to new localities and reintroduction to sites of known or suspected extirpation, and the relationships between climate variation and extinction and recolonization probabilities. This projection will also require incorporating information on new threats at the time of downlisting, such as any new exotic predator introductions that may have occurred (USFWS 2005i).

As part of Camp Pendleton's goby management through implementation of this INRMP, several of the recovery tasks identified in the draft recovery plan have already been implemented on Base. They include: 1) expansion of water quality monitoring from the Santa Margarita River to all eight of the lagoons/estuaries aboard the Base; 2) annual presence/absence monitoring conducted in all eight lagoons/estuaries on Base (almost without interruption since 1996, with monitoring efforts for selected lagoons/estuaries having been conducted on a less frequent basis from as early as 1987); 3) annual removal of non-native aquatic animals from watersheds; and 4) contracting the preparation of a non-native control plan that will integrate all animal removal methods and identify criterion for assessing the effectiveness of control efforts.

F.22.5 Management

The Base has implemented specific management practices that protect the tidewater goby and its habitat. Programmatic instructions and habitat enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) guide the management of habitat for the tidewater goby. These management measures have been implemented on Base since the completion of the plan in 1995 and were incorporated in and have been managed through this INRMP since 2001. The Marine Corps believes that these programmatic management actions provide conservation benefits to the tidewater goby.

Programmatic instructions are provided for users and residents of the Base to avoid and minimize adverse impacts to the tidewater goby. Environmental regulations and restrictions that apply to the tidewater goby and other threatened and endangered species on Base are

provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmental information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on both the Camp Pendleton Military Installation Map and the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to the tidewater goby include: 1) minimized foot traffic in coastal lagoons; 2) rehabilitation efforts for estuarine/beach areas temporarily disturbed from nonroutine maintenance and construction activities; 3) exotic vegetation and aquatic species control; 4) stream water quality, flood regime and storm event frequency monitoring to determine and manage potential effects on the tidewater goby; and 5) annual surveys conducted to determine the presence/absence of tidewater goby populations on the Base. See Appendix N (Section 2007).

In 2004, Camp Pendleton expanded water quality monitoring from the Santa Margarita River to all eight of the lagoons/estuaries aboard the Base that could provide habitat for the tidewater goby. The estuaries/rivers with their corresponding sensor gage numbers are: Santa Margarita River near Fallbrook (11044300), Santa Margarita River at mouth (11046050), Las Flores Creek Lagoon at mouth (11046102), San Onofre Creek Lagoon at mouth (11046252), San Mateo Creek at mouth (11046372), Hidden Creek Lagoon at mouth (11046082), Aliso Creek Lagoon at mouth (11046072), and Cockleburr Creek Lagoon at mouth (11046062). Data collected during water quality and goby presence/absence monitoring will contribute to goby research efforts and will be essential to understanding how water quality parameters correlate with tidewater goby life history parameters.

In spring, summer and fall of 2004, a Camp Pendleton-funded contractor conducted a habitat assessment and subsequent localized removal of non-native aquatic species in the Santa Margarita River and estuary to reduce the potential for the predation of tidewater goby and improve conditions for re-establishment of the tidewater goby (ECORP 2005). Over 5,100 non-native fish and over 2,200 crayfish were removed from the Santa Margarita River and estuary, and additional information was obtained regarding removal of non-native aquatic species (ECORP 2005).

A planned action that supports management of the tidewater goby includes:

- Implement riparian BO (Section 4.3.2.1.).

F.23. WESTERN SNOWY PLOVER (*CHARADRIUS ALEXANDRINUS NIVOSUS*)

FIGURE F-17. MALE WESTERN SNOWY PLOVER
(PHOTO SOURCE: PETER KNAPP, USFWS 2007D)

The western snowy plover, one of two subspecies of snowy plover to nest in North America, is a small shorebird with pale brown to gray upperparts, gray to black legs and bill, and dark patches on the forehead, behind the eyes, and on either side of the upper breast (USFWS 2004d). The Pacific coast population is a distinct population segment (DPS) of the western snowy plover and is defined as those individuals nesting adjacent to tidal waters of the Pacific Ocean.

Pacific coast western snowy plovers typically forage for small invertebrates in open areas that tend to attract their prey consisting of wet or dry beach sand, tide-cast kelp and driftwood, low foredune vegetation, and near water seeps in saltpans. Burrowing invertabrates are located by probing the sand with their beaks. Flying insects are located visually while resting on the ground, and then are captured by snapping at them as they flush while being charged. Accordingly, they need open areas in which to forage and to facilitate both prey location and capture. Prey species include: sand crabs (*Emerita analoga*), crabs (*Pachygrapsus crassipes*), polychaete worms (*Nereididae, Lumbrineris zonata*, etc.), amphipods (*Corophium* spp., etc.), sand hoppers (*Orchestoidea*), flies (*Ephydridae, Dolichopodidae*), and beetles (*Carabidae*, etc.). Plovers forage both above and below the high-tide line, but not while those areas are submerged. Therefore, foraging areas will typically be limited by water on their shoreward side and by dense vegetation or development on their landward side (USFWS 2004d).

Both sexes incubate the eggs; typically females during daylight hours, and males during the night. The male may relieve the female for a period during the day. Females often desert the chicks approximately 1 week after hatching (the last brood of the season may be raised by both the male and female). Leaving the brood for the male to raise allows females to nest up to three times in a season, particularly in more southern areas where nesting seasons are longer in duration. Males typically stay with the chicks until they fledge (take their first flight) about 30 days after hatching. Newly hatched chicks are capable of running and foraging almost immediately; from this point, parental behavior consists of defending chicks from other plovers, brooding them in cold weather, leading them to suitable feeding areas, and warning of approaching predators. Adults may also employ distraction displays to lead predators away from their young. After their first chicks fledge, males may attempt to raise a new brood with a new partner. Both sexes will also readily attempt to renest if they lose an entire clutch of eggs or brood of chicks, assuming enough time remains in the nesting season (USFWS 2011b).

F.23.1 Status

The western snowy plover was listed by the USFWS as threatened on 5 March 1993 (USFWS 1993b). On 2 March 1995, the USFWS published proposed critical habitat for the western snowy plover (USFWS 1995e). The proposal excluded key nesting habitat at Camp Pendleton because the programmatic riparian, beach and estuary consultation was underway, and that designation of critical habitat was determined to provide no additional benefit. The proposal also stated that Camp Pendleton lands provided adequate protection for both nesting and wintering plovers. The final rule for plover critical habitat was published on 7 December 1999, and no critical habitat was designated within the Base boundary (USFWS 1999c). On 17 December 2004, the USFWS published a proposal to designate critical habitat for the Pacific coast distinct population segment of the western snowy plover, pursuant to a court order issued in July 2003, which partially vacated critical habitat established for the Pacific coast population of the western snowy plover and remanded the previous designation of critical habitat, for preparation of a new analysis of the economic impacts (USFWS 2004d). The 17 December 2004 re-proposal of critical habitat, proposed to designate approximately 7,001 ha within 35 units along the coasts of California, Oregon, and Washington. On Camp Pendleton, 23.5 acres of critical habitat identified as Unit 24 (San Onofre Beach) was proposed. This unit is at the northwest corner of Marine Corps Base Camp Pendleton, stretches roughly 2.2 km from the mouth of San Mateo Creek to the mouth of San Onofre Creek, and includes lands leased to SCE/SDG&E for the SONGS and to California State Parks. Two units on Camp Pendleton, 32 ha and 173 ha in size, respectively (roughly corresponding to areas CA–114 and 115 in the draft recovery plan), were proposed to be excluded under Section 4(b)(2) based on the use of these areas as mission-essential training areas. On 29 September 2005, the USFWS issued a final designation of critical habitat for the western snowy plover. Approximately, 16.2 ha of critical habitat was designated on State Park leased lands (Unit 24). However, based on the USFWS review of Camp Pendleton's INRMP, an additional 19.8 ha were excluded because the INRMP was found to provide a sufficient benefit to the species, and exempted the remainder of lands/beaches on Base from critical habitat designation pursuant to Section 4(a)(3) of the ESA (USFWS 2005j).

On 22 March 2004, the USFWS announced a 90-day finding on a petition to remove the Pacific coast population of the western snowy plover from the Federal List of Endangered and Threatened Wildlife and Plants (USFWS 2004e). The USFWS found that the petition presents substantial information that delisting the Pacific coast population of the western snowy plover may be warranted, and initiated a status review. On 21 April 2006, the USFWS announced a 12-month finding on the petition to remove the Pacific coast population of the western snowy plover from the Federal List of Endangered and Threatened Wildlife pursuant to the ESA of 1973, as amended. After reviewing the best scientific and commercial information available, the USFWS found that the petitioned action was not warranted (USFWS 2006d). Thus, the western snowy plover continues to qualify as a threatened species under the ESA. A final recovery plan for the western snowy plover was published on 24 September 2007 (USFWS 2007d). On 22 March 2011, the USFWS proposed to revise the critical habitat designation for the western snowy plover. All 441 ac considered for designation on Base are proposed to be exempted under 4(a)(3) of the ESA in the final rule (USFWS 2011e).

F.23.2 Distribution and Occurrence

The western snowy plover breeds on the Pacific coast from southern Washington to southern Baja California, Mexico, and in interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north-central Texas, as well as coastal areas of Texas, and possibly northeastern Mexico. The Pacific coast population of the species is genetically isolated from western snowy plovers that breed in the interior (USFWS 1993b); the Pacific coast breeding population extends from the State of Washington to Baja California, Mexico with the majority of breeding birds found in California (USFWS 2004d). Sand spits, sandy beaches, seasonally exposed gravel bars, salt ponds and adjoining levees, mud flats, dredge spoil sites, dune-backed beaches, unvegetated beach strands, open areas around estuaries, and beaches at river mouths are the preferred coastal habitats for nesting. These habitats provide microtopographic relief offering refuge from high winds and cold weather, provide cover or shelter from predators, and assist in avoidance of detection (crypsis) for nests, chicks, and incubating adults. No studies have quantified the amount of vegetation cover that would make an area unsuitable for nesting or foraging, but coastal nesting and foraging locations typically have relatively well-defined boundaries between open sandy substrate favorable to Pacific Coast WSPs and unfavorably dense vegetation inland. These bounds show up well in aerial and satellite photographs, which were used by the USFWS to map essential habitat features (USFWS 2007d & 2011b). Western snowy plovers are usually located within 100 m of the shore, but may be farther where shore access remains unblocked by dense vegetation (USFWS 2004d).

On the Pacific coast, larger concentrations of breeding birds occur in the south than in the north, suggesting that the center of the plovers' coastal distribution lies closer to the southern boundary of California (USFWS 2004d). The coastal population of the western snowy plover consists of both resident and migratory birds. Some birds winter in the same areas used for breeding (USFWS 2004d). Other birds migrate either north or south to wintering areas (Warmer et al. 1986). Plovers occasionally winter in southern coastal Washington (USFWS 2004d). Wintering plovers occur in widely scattered locations on both coasts of Baja California, and significant numbers have been observed on the mainland coast of Mexico at least as far south as San Blas, Nyarit (USFWS 1993b).

On Camp Pendleton beaches, the typical breeding season occurs from 1 March through 15 September. Within San Diego County, 72 to 87% of snowy plover nests were located on federal properties from 1994 to 1997; with the majority located on military bases (USFWS 2001a). In 1998, 42% of all the snowy plovers in San Diego County were breeding on Camp Pendleton (Collier and Terp 2001).

Since 1994, Camp Pendleton has performed yearly surveys for the western snowy plover (Table F-14). Nesting sites include: Aliso Beach (White), Cockleburr Beach, North Beach (North), North Beach (South), and South Beach (Collier and Terp 2001). The Base coastline is subdivided into eight sections or training areas that are identified by both letters and colors: Green (A), Gold (B), Red (C, D), White (E, F), Blue (G) and Del Mar Recreation Beach (H). Aliso Beach (White) is located 5.8 km north of the Santa Margarita River and is subdivided by Aliso Creek, which runs through the middle of the site. North Beach (North) is the area immediately north of the Santa Margarita River, and North Beach

(South) is the area immediately south of the Santa Margarita River with the camp Del Mar Campsite as its southern boundary. Salt Flats and Salt Flats Island are located in the saltpan area south of the Santa Margarita River and to the east of North Beach (South) and South Beach. Cockleburr Beach is located in the area between Cockleburr Creek, south to North Beach (North).

In 2001, the western snowy plover constructed 89 nests on Base, nearly double relative to the prior season; see Table F-14 (Foster 2003b). Some of this increase is likely from improved monitoring methods (up to four observers per site) and greater area coverage (four to five visits per week) than in previous seasons. The majority of plover nests were located on North Beach (North and South) (51%) with the remaining at Salt Flats and Salt Flats Island (25%), and Cockleburr and White Beaches (24%). The nesting population of western snowy plovers at Camp Pendleton in 2004 was 212 plover nests, with a conservative estimate of 100 to 130 fledglings present, which is the highest recorded nest total to date (CRES 2009). Figure 3-20 illustrates the general distribution of the western snowy plover on Base.

TABLE F-14. WESTERN SNOWY PLOVER NEST MONITORING DATA, 1994 TO 2009

	# Nests Found	Estimated # Males	Estimated # Females	Total Estimated # Individuals
1994[a, b]	43	40	36	76
1995[a, b]	88	100	70	170
1996[a, b]	81	92	74	167
1997[a, b]	61	96	73	170
1998[a, b]	68	59	53	112
1999[a, b]	42	50	40	90
2000[a, b]	48	42	44	86
2001[b]	89	--	33	--
2002[b]	145	--	--	--
2003[b]	140	--	44	140
2004[b]	212	--	45	212
2005[b]	169	--	--	94
2006[a, b]	82	71	48	127 (8 Unknown Sex)
2007[a, b]	124	45	41	94 (8 Unknown Sex)
2008[b]	--	--	--	117
2009[b]	--	57	49	120 (14 Unknown Sex)

[a] Number of breeding males and females based on actual number of known nests.

[b] Sources for Camp Pendleton plover data: 1994 to 1999 (Collier and Powell 2000), 2000 (Collier and Terp 2001), 2001 (Foster 2003b), 2002 (Foster 2004b), 2003 (Foster 2004c), 2004 (Foster 2005b), 2005 (USFWS 2010b & Kershner pers. comm. 2009), 2006 (USFWS 2010b & Kershner pers. comm. 2009), 2007 (USFWS 2010b & Kershner pers. comm. 2009), 2008 (USFWS 2010b), and 2009 (USFWS 2010b).

F.23.3 Threats

The decline in the western snowy plover population is attributed to human disturbance, predation, and loss of nesting habitat to encroachment of introduced European beachgrass

(*Ammophila arenaria*) and urban development (USFWS 1993b). Beach cleaning activities that remove kelp and rake sand can harm plover foraging success (USFWS 2004d). Both clutches and broods may be lost due to predators, tides, storms, and human recreational activities. Examples include, both repeated flushings of nesting plovers and direct damage to nests or to young resulting from humans, dogs, horses or vehicles that either approach plover nests too closely or actually overrun plovers and nests (USFWS 1993b & USFWS 2004d). Energy is very important to this small bird. Every time humans, dogs, or other predators cause the birds to take flight or run away, they lose precious energy that is needed to maintain their nests. Often, when a Plover parent is disturbed, it will abandon its nest, which increases the chance of a predator finding the eggs, sand blowing over and covering the nest, or the eggs getting cold. This can decrease the number of chicks that hatch in a particular year (Westernsnowyplover.org 2010). Some additional threats range-wide include: shoreline stabilization, dredging disturbance and tailings deposit, sand mining, driftwood removal, beach fires and camping, water course alteration, operation of salt ponds, oil-spills and disturbance from oil-spill cleanups, livestock grazing, increased coastal access to beaches, disturbance from fishing activities, military exercises and aircraft overflights, environmental contaminants, increased predation due to human activities, and lack of protection in Baja California, Mexico (USFWS 2007d).

F.23.4 Recovery Strategy Goals

A recovery plan for the western snowy plover was published in August 2007 (USFWS 2007d). This plan establishes recovery criteria for the Pacific coast population of the western snowy plover and identifies 3 criteria to be met before the species will be considered for delisting. These criteria are:

- Maintain for 10 years an average of 3,000 breeding adults distributed among 6 recovery units as follows: 1) Washington and Oregon - 250 breeding adults; 2) Del Norte to Mendocino Counties, California - 150 breeding adults; 3) San Francisco Bay, California - 500 breeding adults; 4) Sonoma to Monterey Counties, California - 400 breeding adults; 5) San Luis Obispo to Ventura Counties, California - 1,200 breeding adults; and 6) Los Angeles to San Diego Counties, California - 500 breeding adults.
- Maintain a 5-year average productivity of at least 1.0 fledged chick per male in each recovery unit in the last 5 years prior to delisting.
- Have in place participation plans among cooperating agencies, landowners, and conservation organizations to assure protection and management of breeding, wintering, and migration areas listed in Appendix B of the draft recovery plan to maintain the subpopulation sizes and average productivity specified in criteria 1 and 2 above (Appendix B of the draft recovery plan identifies 3 locations on Camp Pendleton: San Onofre Beach, Aliso/French Creek Mouth, and Santa Margarita River Estuary).

Camp Pendleton is located in Recovery Unit 6 and manages identified breeding locations at Aliso/French Creek (Location number CA114) and Santa Margarita River Estuary (Location number CA115). The recovery plan identifies management goals (population

targets of breeding adults) for these locations of 40 and 160, respectively. The recovery plan also identifies management measures or activities which need to be initiated or improved to achieve management goals. Management measures identified for western snowy plover at locations on Camp Pendleton are: 1) prohibit/restrict public access, boats, off-highway vehicles, pets, horses, development, and military uses; 2) conduct population monitoring during breeding and/or wintering seasons; 3) conduct predator control (other than exclosures); 4) conduct plant and exotic vegetation control; 5) use exclusionary signs; 6) symbolically fence (visually segregate) or actually fence nesting areas; 7) provide public information and education; and 8) enforce protective rules and regulations. Camp Pendleton's management program as described in this INRMP accomplishes all management measures at both locations for the western snowy plover on Base.

F.23.5. Management

The Base has implemented focused and specific management practices for protecting the western snowy plover and enhancing its breeding habitat. Programmatic instructions, habitat protection and enhancement measures outlined in the Estuarine and Beach Ecosystem Conservation Plan (Appendix B) guide the management of breeding habitat and foraging areas. These management measures have been implemented on Base since the completion of the Plan in 1995 and were incorporated in and have been managed through this INRMP since 2001. The Marine Corps believes that these programmatic management actions provide conservation benefit to the western snowy plover.

FIGURE F-18. SNOWY PLOVER CHICK BANDING
(PHOTO SOURCE: BONNIE PETERSON, USFWS 2007D)

Management practices conducted for the western snowy plover are similar to those conducted for the California least tern populations on Base, and include: posted signs describing the restricted nature of the area during breeding season, installation and maintenance of permanent/temporary fencing, and removal of vegetation detrimental to nesting sites. Other management practices include monitoring, chick banding, and predator management.

Management practices, projects and programs include: 1) programmatic instructions that are provided for users and residents of the Base to avoid and minimize impacts from training activity and other Base operations to the western snowy plover (e.g., vehicle and foot traffic must be avoided in all posted nesting areas); 2) annual beach habitat enhancement (exotic vegetation control and sand mobilization); 3) annual ant control (White Beach, Cockleburr Beach and South Beach); and 4) annual focused predator control. Additionally, the Base conducts annual nest monitoring to track plover population trends, and is conducting a study and review of potential impacts to plovers from management measures used for the California least tern. Signs are posted at entrances

(along access roads or beaches) to all wetlands, nesting sites, and management zones to deter unauthorized entry. Native and non-native predator/competitor animal species that threaten listed species are also controlled.

Snowy plover breeding activity is closely monitored, so that when they nest outside the traditionally fenced nesting areas, within or outside of established management zones, individual nests and any young produced shall be afforded the best possible protection by posting and fencing around the immediate vicinity of the nest(s). For instance, as a result of the extraordinary 2004 breeding season with 212 known nests recorded, additional protection was provided for these nest sites. Consequently, western snowy plovers have increased their distribution on the Base and now routinely nest north of White Beach.

Environmental regulations and restrictions that apply to the western snowy plover and other threatened and endangered species on Base are provided for all users of ranges and training areas to guide training activities and protect these resources. Natural resource, species and related environmentally sensitive area information for each training area and range is published in Base Order P3500.1N (*Range and Training Regulations*) and depicted on both the Camp Pendleton Military Installation Map and the most current Environmental Operations Map (updated and distributed semiannually). Some specific programmatic instructions applied to western snowy plover include: 1) military activities are to be kept to a minimum within the Santa Margarita Estuary Management Zone and at any other nesting site outside the traditionally fenced nesting areas during the western snowy plover's breeding/nesting season (1 March - 31 August); 2) all activities involving smoke, pyrotechnics, loud noises, blowing sand, and large groupings of personnel (14 or more) must stay at least 305 m away from fenced or posted nesting areas; 3) aircraft are not authorized to land within 300 m of fenced nesting areas on Blue Beach or White Beach, and are required to maintain an altitude of 91.4 m AGL or more above nesting areas; 4) recreational activities are kept to a minimum within the Santa Margarita Estruary Management Zone and posted nest locations during the breeding season, and camping at Cockleburr Canyon Beach is prohibited; 5) foot traffic within the management zone is prohibited within 46 m of posted nesting areas during the breeding season (except for prescribed maintenance and monitoring activities); and 6) surf fishermen are required to stay at least 91 m from posted nesting areas, and no live baitfish or amphibians are allowed for use in fishing. See Appendix N (Section 2007 and Figure 2-1).

A planned action that supports management of the western snowy plover includes:

- Implement riparian BO (Section 4.3.2.1.).

F.24. WESTERN YELLOW-BILLED CUCKOO (*COCCYZUS AMERICANUS OCCIDENTALIS*)

The Western Yellow-billed Cuckoo is a member of the avian Family Cuculidae and Order Cuculiformes. The approximate 128 members of Cuculidae share the common feature of a zygodactyl foot, in which two toes point forwards and two toes point backwards. Most species have moderate to heavy bills, somewhat elongated bodies, a ring of colored bare skin around the eye, and loose plumage. Six species of Cuculidae breed in the United

States; two of these species breed west of the Continental Divide, which are the yellow-billed cuckoo and the greater roadrunner.

FIGURE F-19. WESTERN YELLOW-BILLED CUCKOO

(PHOTO SOURCE: J. A. SPENDELOW, USFWS)

The yellow-billed cuckoo is a medium-sized bird that is about 30 cm long, and that weighs about 2 ounces. The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, in which the upper mandible is blue-black and the lower is yellow. Plumage is grayish-brown above and white below, with reddish-brown primary flight feathers. The dorsal tail feathers are brown, and the ventral tail feathers are boldly patterned with three distinct lateral-columns of black and white spots (SFSU 2003). The legs are short and bluish-gray, and adults have a narrow, yellow eye-ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Males and females differ slightly. Males tend to have a slightly larger bill, and the white in the tail tends to form oval spots, whereas in females the white spots tend to be connected and less distinct (USFWS 2008f). Western Yellow-billed Cuckoos usually raise their own young; however, they are facultative brood parasites, occasionally laying eggs in the nests of other yellow-billed cuckoos or other bird species. Clutch size is usually two or three eggs, and development of the young is very rapid, with a breeding cycle of 17-21 days from egg-laying to fledging of young (USFWS 2008f & SFSU 2003).

F.24.1. Status

The Western Yellow-billed Cuckoo was listed as California threatened on 27 June 1971, and was reclassified as endangered on 26 March 1988 (CDFG 2005b). A 12-month finding for a petition to federally list the yellow-billed cuckoo in the western continental United States under the ESA was submitted on 25 July 2001 (USFWS 2001b), and the species was added to the ESA candidate species list on that date. It currently has a federal listing priority of 3, and emergency listing was found not to be warranted at this time due to persistence of the limited population of the species, and potential protection inadvertently allowed to it under the ESA for other listed riparian species such as, the southwestern willow flycatcher and the least Bell's vireo (USFWS 2008f). Candidate species do not receive protection under the ESA, although the USFWS works to conserve them.

F.24.2. Distribution and Occurrence

Historically, the cuckoo's range was the coastal valleys from the Mexican border to Sebastopol, Sonoma County and the Central Valley from Bakersfield and Weldon, Kern County, north to Redding, Shasta County. Small populations were also found in Northern

California along the Shasta River, Siskiyou County, and in Surprise Valley, Modoc County. Populations were also found in suitable habitat east of the Sierra Nevada in the Owens Valley and along the Colorado and Mojave Rivers (Laymon 1998). Western Yellow-billed Cuckoos appear to require large blocks of riparian habitat for nesting (particularly woodlands with cottonwoods and willows). In California, most eggs are laid from mid-June to mid-July. Migrating individuals move south through the southern and central interior of California in September and October, and return north, March through May.

In California, breeding populations of greater than five pairs that persist every year in California are currently limited to the Sacramento River from Red Bluff to Colusa and the South Fork Kern River from Isabella Reservoir to Canebrake Ecological Reserve. Other sites where small populations of cuckoos (<5 pairs) breed or potentially breed (not necessarily annually) are: the Feather River from Oroville to Verona, Butte, Yuba and Sutter Counties; the Prado Flood Control Basin, San Bernardino and Riverside Counties; the Amargosa River near Tecopa, Inyo County; the Owens Valley near Lone Pine and Big Pine, Inyo County; the Santa Clara River near Santa Clarita, Los Angeles County; the Mojave River near Victorville, San Bernardino County; and the Colorado River from Needles, San Bernardino County to Yuma, Imperial County (Laymon 1998). A survey conducted on the Sacramento River from 1987 to 1990 has shown a fluctuating population of 23 - 35 pairs (Laymon 1998). Continuous surveys on the South Fork Kern River from 1985 to 1996 have shown a population that varied from a low of 2 pairs in 1990 to a high of 24 pairs in 1992 (Laymon 1998).

In San Diego County the Western Yellow-billed Cuckoo, never common, is now only a rare and sporadic summer visitor (Unitt 2004). The only nesting dates reported from San Diego County are of a female with a brood patch collected at Escondido on 30 June 1915, and egg sets collected at Escondido on 3 July 1915 and 2 July 1932 (Unitt 2004).

On Camp Pendleton the Western Yellow-billed Cuckoo has been encountered on only three occasions since 1980: 1) along the Santa Margarita River at the upper end of Ysidora Basin on 4-5 July 1984; 2) again along the Santa Margarita River at the upper end of Ysidora Basin on 7-11 August 2000 (Unitt 2004); and 3) one washed down the Santa Margarita River and was found dead at the river mouth in June 2005 (Kershner pers. comm. 2009).

F.24.3. Threats

The primary threat to the Western Yellow-billed Cuckoo is habitat loss and degradation. Adverse impacts to its habitat are from clearing of land for agriculture and urban and suburban development, human disturbances (e.g., illegal camping), fire in riparian habitat, livestock trampling and grazing on tree saplings, invasion of non-native plants (e.g., tamarisk, salt cedar and giant reed), flood control projects, excessive pumping of groundwater, and diversion of surface water.

F.24.4. Recovery Strategy Goals

There is not a recovery plan established for the Western Yellow-billed Cuckoo; however, California Partners in Flight have addressed habitat and population objectives for the cuckoo in its Riparian Bird Conservation Plan (Laymon 1998). Habitat and population

objectives are addressed only for the central to northern California populations (Laymon 1998).

F.24.5. Management

As an extremely rare migrant through Camp Pendleton, no specific management program or activities have been established for the Western Yellow-billed Cuckoo. However, based on the habitat requirements of the Western Yellow-billed Cuckoo, it is likely that this species benefits from management activities and programs provided for the Least Bell's vireo and the southwestern willow flycatcher as part of the Base's Riparian Ecosystem Conservation Plan. Current basewide management practices include conservation awareness and education programs. Management practices, projects and programs include programmatic instructions that are provided for users and residents of the Base to avoid and minimize impacts from training activity and other Base operations on riparian vegetation/habitat such as: 1) vehicle movement in riparian areas is to remain on existing roads; 2) foot traffic is prohibited in creek bottoms/riparian areas during breeding seasons (except prescribed maintenance and monitoring activities); 3) helicopters, during breeding seasons, operate at a minimum altitude of 61 m AGL over riparian areas; 4) exotic vegetation control (Section 4.4.1.3.); and 5) exotic animal control (Section 4.3.3.2.).

F.25. XANTUS'S MURRELET (*SYNTHLIBORAMPHUS HYPOLEUCUS*)

FIGURE F-20. XANTUS'S MURRELET

(PHOTO SOURCE: DARRELL WHITWORTH, USGS)

The Xantus's murrelet is a small seabird; it is 23-25 cm in length, and weighs approximately 5-6 ounces. Plumage is black above and white below, and except upon careful inspection, the winter plumage is not different from the breeding plumage. They fly close to the water with their heads held straight. The species is known to live up to 15 years in the wild, and they spend a majority of their lives at sea, only coming to land to nest. They begin arriving within the vicinity of nesting colonies in December and January. Xantus's murrelets likely begin breeding at 2 to 4 years of age, and usually nest at the same site each year with the same mate. They begin visiting nest sites up to 2 months before egg-laying, but typically 2 to 3 weeks prior. Nesting within the population is asynchronous, spanning a period of up to 4 months (March-June), and peak time of egg-laying varies from year-to-year.

Xantus's murrelets congregate on the water adjacent to nesting colonies at night throughout the breeding season and engage in vocalizations. The purpose of these nocturnal at-sea congregations may be for socialization, courtship, pairing and pair-bond maintenance. The majority of murrelets in these congregations are likely non-incubating, because incubating

murrelets may only briefly attend congregations before flying to nests after returning from foraging trips, or during chick departures from the nest. Xantus's murrelets nest in small caves, rock crevices, cavities under boulders or roots, and under dense vegetation on offshore islands or associated rocks, often along steep slopes or cliffs. No additional material is added to the nest, and the site may either be a shallow scrape if the ground is soft, or remain unmodified. They are nocturnal in their arrival to or departure from nests, presumably to avoid detection by avian predators such as gulls, owls, and falcons.

Xantus's murrelets typically lay two eggs, and both parents share incubation duties. The first egg is left unattended until after the second egg is laid, for an average of 8 days (range: 5 to 12 days), and incubation lasts about 34 days after clutch completion (range: 27 to 44 days). Eggs are also periodically left unattended during incubation, presumably because one member of the pair will depart to feed before the other returns; egg neglect increases the total length of incubation. Unattended eggs are susceptible to predation primarily by native deer mice or introduced rats. Each parent spends an average of 3 consecutive days incubating eggs before being relieved by their mate (range: 1 to 6 days). These incubation shifts are among the longest recorded for alcids. Chicks hatch between early April and early July, and are born precocial (covered with down and fully active). The chicks are not fed in the nest after hatching, but go to sea with their parents at about 2 days of age (range: 1 to 5 days). The chicks are escorted out of the nest by their parents, and then they either jump from the cliff edge or are blown into the surf below, with their descent escorted by flock members, while the parents vocalize from the sea below. Once reunited in the sea, family groups swim rapidly offshore and away from nesting colonies, presumably to avoid predation (USFWS 2008j).

F.25.1. Status

The Xantus's Murrelet was listed as a federal Candidate species on 4 May 2004, and has a listing priority of 5. The species could not be listed as federally threatened or endangered due to limited population data (USFWS 2008j). Candidate species do not receive protection under the ESA, although the USFWS works to conserve them.

A petition to list the species as State threatened was submitted to the California Fish and Game Commission in April 2002 by the Pacific Seabird Group (PSG). After conducting a year-long review of the status of the species, the Fish and Game Commission determined that Xantus's Murrelet should be listed as a threatened species under the CESA on 24 February 2004. As part of the normal listing process, this decision was reviewed by the Office of Administrative Law, and the listing became effective on 22 December 2004 (CDFG 2004a).

The Xantus's murrelet is also listed as threatened in Mexico under *Norma Oficial Mexcana* NOM-Ecol-059 (USFWS 2008j).

F.25.2. Distribution and Occurrence

The Xantus's Murrelet has a limited worldwide distribution, nesting on only six of the California Channel Islands, and six islands along the coast of Baja, Mexico. The population estimate for California is 1,730 pairs, and for Mexico it is 2,425 pairs. Approximately 51%

of the California population nests on Santa Barbara Island, the smallest of the Channel Islands, measuring only one square mile in size (CDFG 2004a).

Xantus's Murrelet activities have been repeatedly observed on Base in coastal waters immediately offshore, and have been found washed-up dead onshore (Kershner pers. comm. 2009).

F.25.3. Threats

Xantus's Murrelets are impacted by a number of threats. Much of their small population lives and breeds along the busy shipping lanes of southern California's major port cities, where they are particularly vulnerable to pollution, and a single oil spill could prove disastrous to all the Channel Island breeding colonies. Habitat destruction such as the introduction of non-native species on every single island where the Xantus's Murrelets nest, and depredation of eggs and young by introduced species has driven the murrelets entirely from some breeding colonies, and reduced their numbers drastically at many others (National Audubon Society 2009).

Artificial lighting and noise from boating, fishing, and military activities onshore and offshore may also have contributed to declines. Artificial lighting causes many animals to become disoriented at night, resulting in injuries from collisions, and mortality from predators that capitalize on the illuminated environment and the dazed and vulnerable prey (CDFG 2004a).

Xantus's murrelets feed on small schooling fishes such as Northern anchovies (*Engraulis mordax*), rockfish (*Sebastes* sp.), sand lance/sandeels (*Ammodytes* sp.), larval Pacific sauries (*Cololabis saira*), and euphausiids (*Thysanoessa spinifera*). Since reproductive success of seabirds is dependent upon the availability and abundance of prey, declines in the Xantus's murrelet population could be a result of declines in prey resources. Xantus's murrelets on Santa Barbara Island have been observed to respond to the unavailability of larval northern anchovies by either failing to breed or delaying breeding until anchovies were more available. Changes in oceanographic conditions, such as large shifts in sea surface temperatures, may affect Xantus's murrelet food supply. For example, Zooplankton (e.g., euphausiids) in the Southern California Bight has declined by 80% between the 1950's and early 1990's. More information on the subject of prey decline is needed (USFWS 2008j).

F.25.4. Recovery Strategy Goals

The CDFG intends to work with other agencies and private interests to increase awareness of the effects of artificial lights and other disturbance factors on Xantus's Murrelets and other nocturnal seabirds. CDFG will also work to recover murrelet populations by increasing cooperation and coordination among various agencies and non-governmental organizations to prioritize and implement management recommendations, establish recovery goals, and share in research and monitoring activities. CDFG's immediate conservation goal is to stop the existing population decline (CDFG 2004a).

F.25.5. Management

No specific management program or activities have been established for the Xantus's Murrelet on Camp Pendleton. This species may indirectly benefit from management activities and programs provided as part of the Base's Riparian Ecosystem Conservation Plan and adherence to the Clean Water Act. Current basewide management practices include conservation awareness and education programs. Management practices, projects and programs include programmatic instructions that are provided for users and residents of the Base to avoid and minimize impacts from training activity and other Base operations on riparian vegetation/habitat: 1) vehicle movement in riparian areas remain on existing roads; 2) foot traffic is prohibited in creek bottoms/riparian areas during breeding seasons (except for prescribed maintenance and monitoring activities); 3) helicopters, during migratory breeding seasons, operate at a minimum altitude of 61 m AGL over riparian areas; 4) exotic vegetation control (Section 4.4.1.3.); and 5) exotic animal control (Section 4.3.3.2.). However, species specific management practices may need to be developed in the future as more information becomes available about the species use of Base habitat. Since the species only comes to shore for nesting purposes on offshore islands it is unlikely impacted by onshore Base training activities, but may be potentially impacted by amphibious training activities offshore during migration/dispersal periods, which fall under the jurisdictional responsibility of the USFWS primarily through the: Migratory Bird Treaty Act, Fish and Wildlife Conservation Act, Endangered Species Act, and the National Wildlife Refuge System Administration Act (see 4.3.6. Marine Fisheries Issues).